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Early Polishing Machines

A Discussion of the Progress of Automatic Polishing Machines. Automatic Polishing Forty Years Ago

Written for The Metal Industry by THOMAS HARPER, Brass Foundryman

The article on the subject of "Progress of Automatic Polishing Machines," in THE METAL INDUSTRY for April, 1925, page 161, interested me very much, and it seems from reading the article by Mr. Campbell, that The Robinson Automatic Machine Company has made substantial additions to the art. But I think I can give three good reasons for taking exception to his broad statement that "**Twenty years ago** such a thing as the automatic polishing of metal surfaces was an **unheard of thing.**"

During the year 1879 the writer was taken through a part of the works of the Carron Iron Company in Coatbridge, Scotland, and there they were grinding and polishing sad irons as nearly automatically as it can be done today. So far as I know they may have done the work that same way in the time of Mary, Queen of Scots, for it was this same Carron Iron Works that made the first cannon used in Scotland, "Mons Meg," that is still in existence and shown in the grounds of Edinburgh Castle. They must have used sad irons then judging by the ruffles that were worn in those times.

I have no doubt that the credit for first seeing the possibilities of polishing machines should go to the manufacturers of iron goods, but not necessarily to the present day manufacturers of stoves, ranges and electric irons, unless as successors to the old manufacturers of sad irons and of hot plates for open fires. The methods used then were very different from today's, but in some cases could be used with profit, for I think in some respects they are superior to present practices and ought to be investigated by the U. S. Bureau of Standards in its work of standardization of the polishing and plating industry.

The following brief description of the grinding and polishing of sad irons will show the methods used. The grinding unit was a large grindstone, over eight feet in diameter, running horizontally with water running continuously on it near the center. Attached to the frame surrounding the revolving stone were fingers pointing towards but with a slight pitch off the center, spaced about a foot apart and just above the grindstone. This allowed about twenty-five pieces to be ground at one time by placing a piece against each finger. The operator simply laid the article face down on the grindstone, the fingers prevented them from swinging around with the stone and thus they were ground with a very smooth cut and very quickly. From the grinstone they were transferred to another horizontal wheel where they used crocus as the polishing agent and from that to another horizontal wheel where they used rouge, giving a surface as bright and as smooth as polished glass. All of the wheels were mounted horizontally in the same manner as the grindstone and had similar frames and fingers.

I am of the opinion that to surpass those methods either in simplicity, efficiency, or automatic features, it will take some doing. But it's very old.

FIG. 1. TUBE POLISHING MACHINE

Further on Mr. Campbell states "The polishing and buffing of brass and iron tubing is a newer development but is making rapid strides." This is not so new. If you look up Patent No. 505,221, Sept. 19, 1893, as per Fig. 1 you will become acquainted with a machine that handled tubing or rods efficiently. This machine was never placed properly on the market due to the death of the principal or moneyed partner the same day as the patent was granted, a quarrel between the other partners, and the panic and depression in business during the years 1893-4-5. And, as usual, the inventor was broke and

had to get a job and hustle for three meals a day and forget his dreams.

The central idea of that device is the spiral feeding-through of the tube to be polished in contact with the buff and the mechanical combinations necessary to make it adjustable and operative. The illustration will make it clear, I think.

The shell polishing type of machine is shown in Fig. 2, a machine that is used today and is more than twenty years old, and is Patent No. 393,799, November 13, 1888 (the year of the blizzard in New York). In those days the production of goods was not so large as now but it was used by the manufacturers of nickel clocks and of kerosene lamps and by such representative companies as the Ansonia Clock Company which had seven of these machines; Ansonia Copper Company—two; Holmes, Booth & Hayden—2; Waterbury Clock Company—5;

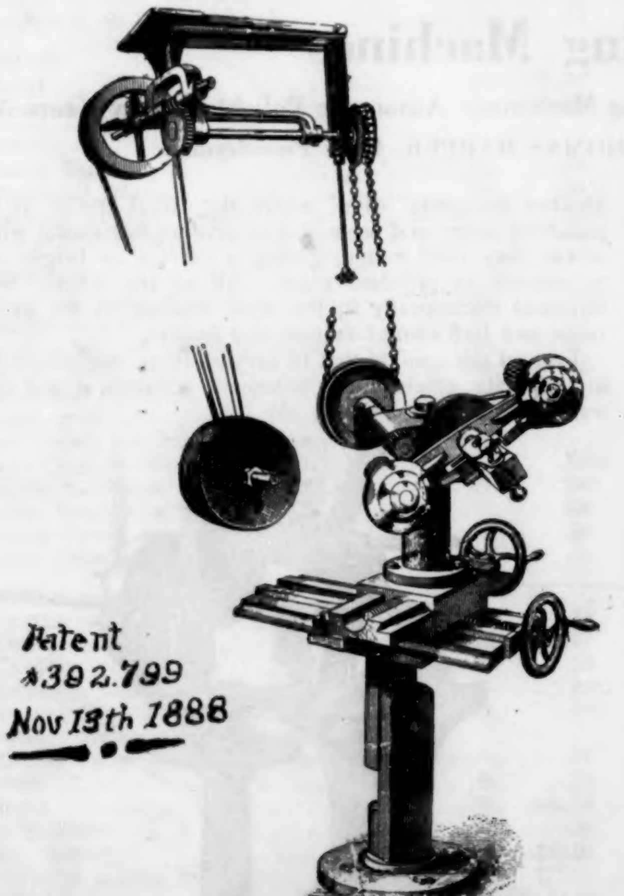

FIG. 2. SHELL POLISHING MACHINE

Gilbert Clock Company—3; Swann & Whitehead—5; Bradley & Hubbard—3; Meriden Malleable Iron Company—2, and a large number of others whose names I do not recall.

The central idea in this machine was the use of two twin chucks on an arm so that one piece would be held in contact with the buff and slowly revolved and polished while the polished shell on the other end of the arm was replaced with an unpolished shell. And, of course, there were the necessary mechanical combinations to throw it in and out of gear and to make it adjustable to different shapes and sizes of shells in carrying out the central idea.

Mr. Davis, who was at that time the Chief of the Ansonia Clock Company, a strong, vigorous, and positive personality, stated to the writer that this machine increased production from 400 shells per day to 2,100 per day for each operator. It decreased the amount of polishing composition used per shell by 50 per cent, and there was a like saving on buffs. When the writer advised that the speed of the polishing spindle be cut down 500 turns and high grade bleached buffs be used instead of unbleached, it resulted in a large economy in power used and a very much greater saving in buffs. It also stopped the cluttering up of the exhaust system with buff threads and composition and still further increased the quality and quantity of production.

Of course, there were the usual strikes of workmen who tried to break and disable the machines on their first introduction. On the first machine installed at the Ansonia Clock Company in Brooklyn they broke the gears. Then after new gears were furnished they set the buff on fire from friction in an attempt to burst the belt by feeding the shell too hard against the buff. Mr. Davis was in the shop with his dinner pail before 7 o'clock the next day, picked out a good hefty monkey wrench and ran the machine all day with the wrench beside him. He told the foreman the results he expected and got them. Then he ordered another six machines.

Waterbury, Conn., was strongly organized with the Knights of Labor and the machines were put out of some shops by strikes. A Waterbury newspaper published caricatures and articles ridiculing the "Iron Man" and an entertainment committee was appointed by the union to attend to me when I came to Waterbury. At the Waterbury Clock Company Archie Bannatyne, a Scotchman and an ex-blacksmith put it across as Mr. Davis had done. The Holmes, Booth & Hayden Company put its machines in an experimental annex and ran them there. The Plume & Atwood Company refused to receive a machine on trial after having given an order. We ordered it to be turned over to Matthews & Willard Company and in transferring it from the freight station to them it was dropped accidentally (?) and they did not pick out a soft place to drop it. We got back the pieces.

At Meriden, Conn., the Bradley & Hubbard Company had a strike for several weeks but through the friendship and determination of Mr. Hubbard the machines stuck.

In 1892 the Benedict & Burnham Company of Waterbury ordered a tube polishing machine. When it arrived they wired for me. The superintendent asked me please to take it back, explaining that my first shell polishing machine had raised Cain in Waterbury and they believed the tube polishing machine would start another outbreak.

The shell polishing machines cost $125.00 each to make including boxing and carting to the dock in New York and were sold F. O. B. New York for $450.00 net. They were worth the price as a labor-saving device. Most of these machines were sold in the first six months after their introduction. I think about 180 in all were sold.

After the patents expired in 1905 it was manufactured by a concern in Buffalo, N. Y., and extensively advertised in THE METAL INDUSTRY, and I believe a great many were sold due to development of the gas fixture business. Naturally there were some slight changes, such as a flexible shaft replacing part of the overhead rig, and the other day I saw a machine with an electric motor instead of the overhead rig. But still it's the old machine's principle for polishing, invented in 1886 and 1887.

For the above reasons and the savings effected in our own shop in New York we thought and still think we devised some automatic polishing machine nearly **forty years ago.**

I have no doubt that there are other old timers who could tell of other machines used by one concern or another that had never been patented and that were

really before their time. I feel sure THE METAL INDUSTRY would like them to step up and tell what they know. But as those illustrations and patent numbers show, it would be well for an inventor or manufacturer to inform himself fully as to the progress or state of the art, by examining the patent files before claiming that the only advancements that have been made came during this present generation or "the last twenty years." Give credit where credit is due, from the first one that received a patent for an invention or a compilation up to the last in the art. For on a close examination of the records you will find that most inventions today are only compilations of what has been done before and are not always improvements. That is my reason for advising the examination of the records.

Of course, in suggesting that you should examine the patent records I know of the difficulties in the way, both in time and money, and that the average individual after finishing his experiments has little to spare of either. To go to Washington from Detroit, Chicago, New York, or other cities to look over the classified files is a great hardship, as I found out over forty years ago especially when looking for something you don't want to find. But it was harder searching through the files of The Patent Gazette in the old Astor Library and the Cooper Library in New York, in the old days, for possible interferences though at that time there had only been abut 200,000 patents issued, and now with over 1,500,000 patents issued, the hardship is greater.

At that time I hoped that the next head of the Patent Office would recognize the need for having established and maintained in every large center duplicates of the files, classified and sub-classified as they are kept in Washington, and open to the public. It has not been done yet, although I am still hoping it will be done and that Secretary Hoover will be the man to do it, and do it properly.

I think Mr. Hoover is a big enough man to recognize that our industrial position is due to our patent laws, and that they created the urge for the individual development which is the force that has built up the prosperity of this country. Anything he can do to remove obstacles in the way of inventors will benefit the whole of the people of the country, as individuals, and give us a still larger per capita production and a still higher standard, per capita, of living.

Standard Threads for Conduit Pipe

Q.—We are manufacturing some electrical fixtures, the specifications for which American pipe and conduit threads are named. Can you give us any information with regard to United States standard conduit threads?

A.—While no national standards of present practice in threading conduit have yet been made, for at least six years back there have been certain standards on paper, which I understand are generally followed by the manufacturers of this material. In November, 1917, the Underwriters' Laboratories published a bulletin covering rigid conduit. The following information concerning the threads is from their report. As will be seen, the type of thread is based on the American standard pipe thread. As defined in the Underwriters' Laboratories' pamphlet no provision is made for gaging this thread.

"Threads on conduits, couplings, elbows and bends must be full and clean cut. When threads are cut before the pickling operation or the cleaning process they are likely to be eaten away by the acid, so that very little of the metal remains, especially at the top of the threads. This condition on finished conduit must be guarded against and calls for careful inspection and sorting by the manufacturer of the tube both before and after pickling, and before must be corrected by re-cutting the threads or the tube the coating is applied. When such a defect is found it must be rejected for conduct purposes.

"Sometimes threads are cut after the protective coating is applied or after the first dip in the case of enamelled conduit. In such cases they must be treated to prevent corrosion before the conduit is actually installed. When threads are cut on otherwise finished conduit they must be given a special protective coating.

"The pitch of threads must conform to the Briggs standard for pipe threads. The pitch of the thread (number must conform per inch of thread) and the length of thread at each end must be standard. The taper of threads on conduit must not exceed ¾ inch per foot. Couplings must be tapped straight. When solid threading dies are used and the threads are cut too long this condition can be overcome by using self-opening dies. When the length of threads does not vary from the nominal length, more than 1½ threads, above or below, for sizes up to and including 2 inches, or one thread for sizes above 2 inches, the resulting condition may be considered acceptable, but should be called to the manufacturer's attention. When the total length of thread varies from the nominal length of threads mentioned the pipe or fittings should be rejected for conduit purposes, but may be sent back to be rethreaded."—P. W. BLAIR.

Manufacture of Artificial Wood

The production of artificial wood is a very interesting subject because it is possible to use plastic mixtures of sawdust of the various woods to product articles of endless variety by the aid of metal molds under high pressure.

A recent Norwegian patent gives the following data covering the production of such artificial wood. Mix 90 parts of selected wood sawdust with 10 parts of whiting; the sawdust should be so manipulated that it is entirely covered with the whiting. Prepare a glue solution as follows: 7 parts by weight of joiners' glue should be thoroughly mixed with 90 to 95 parts water by weight. Heat to about 160° F. When the solution of glue is complete and cool, add from 5 to 10 parts of acetic acid. The glue solution so prepared should be mixed with an aqueous solution of bichromate of potash in proportions of 2 to 3 percent, based upon the weight of the dry glue originally used. Use as little water as possible for solution of the potassium bichromate. The complete solution should now be mixed with the first mentioned sawdust and chalk mixture on the basis of 100 lbs. of glue mixture to 225 lbs. of the sawdust mixture. The moistened mass is worked thoroughly, like kneading bread, preferably in daylight. The mixture should then be placed in suitably prepared iron molds with the smooth interior surface of design that is required in the artificial wood.

The molds should be placed under high pressure for two hours. The artificial wood articles so formed should then be thoroughly dried, and finished in any finish desired. Other substances than whiting can be used, such as soapstone of talc, but whiting apparently give the best results. —C. H. PROCTOR.

Casting and Melting Troubles

Getting Around Snags in Making Push Plates, Car Journals, Rods and Manganese Bronze Castings.

Written for The Metal Industry by WILLIAM J. REARDON, Foundry Editor

BRASS AND BRONZE PUSH PLATES

Q.—We have trouble in our brass moulding shop with casting brass and bronze push plates. We are mailing you one plate of which we have finished one-half, and left the other half the way it came out of the moulding shop. You will notice a lot of pinholes in the casting and also note that after the plate has been finished it shows these pin holes worse than on the rough casting; also the metal does not seem to be clean, as the finished plate is dirty on the surface. We are casting with a No. 20 crucible, do not dry our moulds, and we tried all kinds of mixtures such as copper 60 per cent, zinc 40 per cent. We also tried short ends of brass rods, which were made by a brass company. We are, however, unable to get a clean sprue on top. We ask you to kindly let us have very detailed information what we shall do:

1. How to gate the patterns.
2. Mixture of metal for plates in brass and bronze.
3. What flux to use in order to pour metal clean.
4. Whether to dry moulds or if green moulds would do.
5. What kind of wheels to use in polishing, buffing, and coloring the plates after they are cast.

A.—We received the sample casting, and on examination we are of the opinion your trouble is caused by your adding too much aluminum to your mixture; also shrinkage. If you will make these castings of a mixture of 58½ per cent copper, 41 per cent zinc, ½ per cent aluminum,

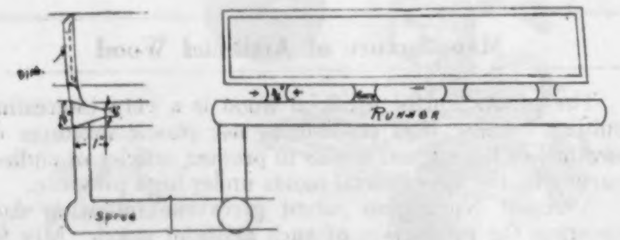

FIG. 1. GATING BRONZE PUSH PLATE

and gate as per sketch you will have eliminated your trouble with this color mixture.

We would answer your questions as follows:

1. How to gate pattern.
   As per sketch.
2. Mixture of metal for plates in brass and bronze.
   Brass mixture as given above. Bronze mixture, 87 per cent copper, 7 per cent tin, 2 per cent lead, 4 per cent zinc.
3. What flux to use.
   Common salt.
4. Whether to dry moulds or if green would do.
   Green moulds will do for the brass mixture. Would suggest skin drying for the bronze mixture.
5. What kind of wheels to use in polishing, buffing and coloring the plates after they are cast.
   We have no preference.

BABBITTING CAR JOURNALS

Q.—We desire to obtain information about the manufacture of lead lined and babbitt lined car journal bearings. We are having trouble making the babbitt stick to the brass. Can you advise us what the essential points are in making and pouring the babbitt so that it will fill the mould full; so that it will stick tightly, even when thrown around in shipping, etc.; and when babbitt is machined the surface will be clean and free from dross, large blubbers, etc.

Both our brass and babbitt are made of new metals by a reputable manufacturer. The brass is about 21 per cent lead, 5 or 6 per cent tin and balance copper. The babbitt is the genuine formula, 4 per cent copper, 7 per cent antimony, 89 per cent tin. The lead lining is made of 87 per cent lead, 13 per cent antimony. The backs for the lead lined brasses is 70 per cent copper, 5 per cent tin, 25 per cent lead.

The brasses are first bored out and surfaces are usually very clean. They are next cleaned with muriatic acid cut with zinc; then heated and tinned with an asbestos swab. Both genuine babbitt, pure tin and half and half solder have been used for tinning. Salammoniac and soldering fluxes have been used for fluxing, separately, of course. Brass and mandrel are heated in artificial gas furnace.

We have heated the bearings in the kettle of babbitt by dipping, but this method leaves the backs dirty and sometimes melts off the edges or corners of the brass. The mandrel is well heated and surface kept clean. The babbitt thickness is 3/16 in center and 1/16 on both edges. This is bored out afterwards to 1/16 in center and nothing at edges. Mandrel is clamped securely to brass and joints stopped with fire clay. If metal is poured hot it seems to stick better, but it seems almost impossible to keep it from running out, leaving large holes in bearings. If poured cold it does not run so well and we believe comes loose from brass after it is cooled.

Is there any test demanded of bearings, except tapping them with hammer to make them ring true? This test does not seem to us to be conclusive with lead lined bearings, as it was difficult to dislodge the lead lining on some that had a somewhat dead tone.

A.—It is rather hard to say just what your difficulty is, as a tinned bronze bearing should give a very tight babbitt lining, and if the work is done properly, will ring like a bell. If not, it will sound hollow and dead. We can only give you the rules to follow to insure good tight babbitt lining in brass and bronze shells.

First: If the shell is bronze the surface should be tinned to allow the lining metal to adhere to the shell. Heat until a bar of solder will melt when in contact with the shell. Swab over the surface to be tinned with a piece of woolen waste dipped in a solder flux, consisting of one part zinc and three parts muriatic acid. Then rub over the surface to be lined with half and half solder. Sometimes it is neces-

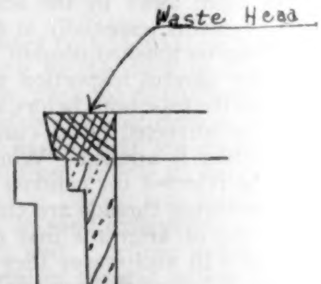

FIG 2. POURING CAR JOURNAL

sary to follow with a hot soldering iron to get a good coating.

When pouring place the bearings in a vertical position, also provide a waste head in order to avoid shrink holes, similar to sketch. Heat the bearing to a temperature that when water is sprinkled on it the water will evaporate readily. However, if your metal is free from oxide the heating of the bearings is not necessary, but will insure a good job.

Second: Melting. The metal should be placed in the melting kettle and heated quickly to a red heat so that the different metals will combine. If allowed to melt slowly the metals separate. Powdered charcoal is used as a cover to avoid waste by oxidization. The metal is now stirred thoroughly and more ingot is added to bring the metal down to a pouring temperature. To determine the pouring temperature it can be tested as follows: Hold a dry pine stick lightly in the liquid metal or a piece of cardboard paper. When the stick trembles in the hand or the paper turns brown the metal is ready for pouring. It should be skimmed clean and a small amount of rosin thrown on the surface to clean the oxide.

The test demanded on the bearings is that they must be free from dross or oxide spots and when tapped with a hammer must sound solid. The test is simple and has been found accurate.

COMPOSITION BARS

Q.—Having trouble in casting bars 24" long, seven to a flask, with a five inch cope. We use coke furnace. Mixture is 83 copper, 8 zinc, 6 lead, 3 tin, and the balance, ingots of 85, 5, 5, 5. The foreman says it is the molder's fault and I say it is not, as the mold is not packed hard. I think it is oxygen that makes them porous, as when he melts the metal he puts the pot in and does not put charcoal in. So I am sending you a sample to know where I stand.

A.—On examination of your sample we are of the opinion your trouble is due to shrinkage, as it is quite a hard job to pour seven ⅝ bars, 24" long in mold without

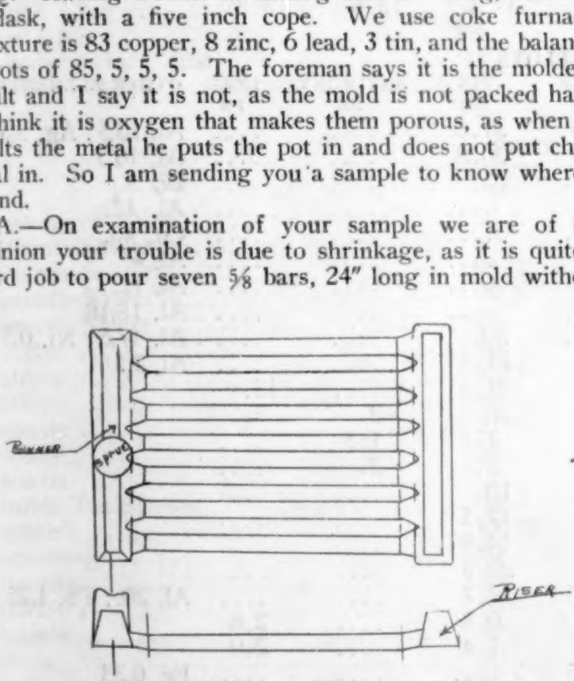

FIG. 3. GATING COMPOSITION BARS

shrinkage. We would suggest you try gating and risers as per sketch. We also suggest you use 4 oz. of 30 per cent manganese copper per hundred pounds of metal.

MANGANESE BRONZE PROPELLERS

Q.—We have a brass foundry in connection with our name plate business where we make manganese bronze propellers for boats. We are having considerable amount of trouble because castings do not come out clean and because small black spots appear on them after they are polished. Will you please advise us of the best way of gating such work and also the cause and means of prevention of the black spots.

A.—The method generally used for gating propellers is with a horn gate similar to sketch. This method of gating assures you of a clean casting. As far as the

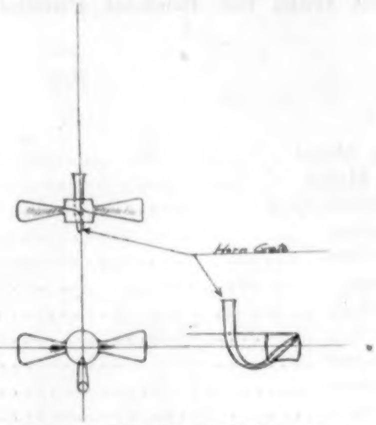

FIG. 4. GATING PROPELLERS

molding is concerned, however, to use a good grade of manganese bronze to get good clean castings, scrap manganese bronze is never satisfactory for this class of work. The best way to do is to purchase a good ingot manganese bronze made from new metal, from a reliable dealer.—W. J. R. PROBLEM.

MIXING MANGANESE BRONZE

Q.—We desire to melt manganese bronze in an open flame, oil fired, furnace to pour heavy section worms ranging in weight from 150 lbs. to 200 lbs., and I would appreciate any information you can give me on this subject.

We have made these worms in the past from a copper-tin bronze of the following composition: Copper, 86.00; tin, 7.50; lead, 1.50; zinc, 3.50; nickel, 1.50. In a heavy section such as a worm we have trouble with openness and porosity when a deep cut is taken on this metal. The metal at the surface is very good.

I now feel that a manganese bronze will give a more homogeneous metal and also will be stronger. The main point is, can this metal be melted successfully in an open flame furnace?

Kindly give us full information on this matter. We desire to know the oxidation loss, how to add the zinc to make up for this loss, the pouring temperature, what temperature to heat it to when melted, the shrinkage, and any other points bearing on this subject.

A.—Manganese bronze is made very successfully in the open flame furnace. It gives you the opportunity to test your metal before pouring, which is a very good point, and the zinc to be added is determined by this test.

If you make your own manganese bronze, melt the copper first. Get it good and hot, then add your hardener which is composed of the iron and manganese. Stir well and add the zinc a little at a time. Stir well and add the aluminum. Then blow your furnace for about five minutes and test by pouring a small amount of the metal in an ingot 2 in. x 1 in. x 12 in. Test this ingot by using a sledge hammer and breaking. From the amount of sledging it takes and the fracture, you can tell how much zinc to add, if any. The loss in melting ingot is about 6 per cent and if you use ingot add about 3 per cent before taking the same test. This method of testing gives you very good control of your metal. You understand of course, that in making manganese bronze castings it requires large risers, bottom pour and long run in the gate, before entering the casting.

The metal shrinks considerably in pouring. The temperature should be such that the metal just smokes when turned back by the skimmer.

A List of Alloys

Reprinted from the Booklet Published by the American Society for Testing Materials. Part 11*

By WILLIAM CAMPBELL†

LEAD BASE ALLOYS

	LEAD PB	TIN SN	ANTIMONY SB	COPPER CU	OTHER ELEMENTS
Terne Metal	88.25	18.	1.75	....	
Type Metal	70.	10.	18.	2.0	
English, Old	69.2	9.1	19.5	1.7	
English	63.2	12.	24.	0.8	
English	60.5	14.5	24.2	0.8	
Krupp	59.6	12.	18.	4.7	Ni, 4.7; Bi, 1.
English	58.	15.	26.	1	
English	77.5	6.5	16.	....	
German	75.	2.	23.	....	
German	60.	35.	5.	....	
German	60.	34.6	5.4	....	
German	60.	15.	25.	....	
Common	60.	10.	30.	....	
Common	55.5	40.	4.5	....	
Best	50.	25.	25.	....	
French	55	22	23.	....	
French	55.	15.	30.	....	
Ulco	98.5	....	....	....	Ba Ca, 1.5
White	77.	5.	15.	2.3	
White	33.	53.	10.6	2.4	Zn, 1
White	33.9	49.1	13.6	3.3	

ZINC BASE ALLOYS

	ZINC ZN	COPPER CU	TIN SN	ANTIMONY SB	LEAD PB	OTHER ELEMENTS
Aluminum Solder, Frismuth	47.5	5.5	31.5	....	....	Al, 10.5; Ag, 5.5
Aluminum Solder, Frismuth	47.4	5.3	36.8	....	....	Al, 10.5
Aluminum Solder	30.	....	65.	....	....	Bi, 5.
Aluminum Solder	80.	8.	....	....	....	Al, 12.
Aluminum Solder	57.	....	....	....	....	Cd, 43.
Aluminum Solder, Mourey	94.	2.	....	....	....	Al, 4.
Aluminum Solder, Mourey	80.	8.	....	....	....	Al, 12.
Aluminum Solder, Bourbouse	81.82	....	....	....	....	Al, 18.18
Aluminum Solder, Cornande and Cruiys	52.	....	30.	....	....	Al, 17.5; Ni, 0.5
Aluminum Solder, Richards	25.	....	71.5	....	....	Al, 3.5
Battery Plates	63.4	3.2	21.3	....	12.	
Babbitt Metal	69.	5.	26.	3.	5.	
Bearing, Hard	90.	7.	1.5	1.5	....	
Bearing	88.	8.	2.	2.	....	
Bearing	85.	5.	10.	....	....	
Bearing	77.	5.5	17.5	....	....	
Bearing, English	67.7	7.4	14.9	....	....	
Bearing	66.5	4.2	29.3	....	....	
Bearing	55.	0.55	22.7	....	....	Al, 20.; Pb, 1.25
Biddery	90.2	6.3	0.8	....	2.6	
Biddery Henie's	84.3	11.4	1.4	....	2.9	
Birmingham, Platina	79.4	20.25	....	....	....	Fe, 0.33
Brittania, Cast	48.	3.	48.	1.	1.	
Button	80.	20.	....	....	....	
Cook's Alloy	31.5	....	....	68.5	....	(Zn, 43.; Sb, 57.)
Dunnlevic and Jones	52.	1.6	46.	0.4	....	
Dunnlevic and Jones Antifriction	20.	....	....	20.	60.	
Dunnlevic and Jones Antifriction	85.	5.	....	10.	....	
Dunnlevic and Jones, Russian	80.	8.	....	10.	....	
Ehrhardt's Metal	89.	4.	4.	....	3.	
Ehrhardt's Type	89.	3.	6.	....	2.	
English White Metal	76.2	5.6	17.5	....	....	
Fenton's Alloy	80.	6.	14.	....	....	
Fenton's Alloy	80.	8.5	....	14.5	....	
Glievor Bearing	73.5	4.4	6.7	9.	5.	Cd, 1.4

*This booklet can be obtained from THE METAL INDUSTRY for $1. Parts 1, 2, 3 4, 5, 6, 7, 8, 9 and 10 appeared in our issues of March, April, May, July, September, December, 1923; June, July, August and September, 1924.

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	ZINC ZN	COPPER CU	TIN SN	ANTIMONY SB	LEAD PB	OTHER ELEMENTS
Hamilton Metal	93.4	3.5	....	1.5	3.1	Phos. Sn, 5.
Heavy Axle	47.	1.	38.	6.	4.	
Hammonia Metal	32.25	3.25	64.5	....	....	
Iridium	77.25	1.12	21.63	Trace	....	
Iridium	83.00	1.25	15.75	Trace	....	
Kemlet	67.	9.	....	....	....	Al, 15.
Kneiss Metal	50.	....	25.	....	25.	
Kneiss Metal	40.	3.	15.	....	42.	
Leddel Alloy	90.	5.	....	....	....	Al, 5.
Ledebur's Bearing	85.	5.	....	10.	....	
Ledebur's Bearing	77.	5.5	17.5	....	....	
Leddel Bearing	87.5	6.25	....	....	....	Al, 6.25
Lumen	86.	10.	....	....	....	Al, 4.
Lumen	85.	10.	....	....	....	Al, 5.
"Hartzink"	91.9	0.13	....	....	2.4	Fe, 5.3
Parsons White Brass	30.	5.	65.	....	....	
Pierrot Metal, Beugnot	83.3	8.3	7.6	3.5	3.	
Propeller Bushing	69.	5.	19.	7.	....	
Pump Cocks	72.	7.	21.	....	....	
Russian, Packing	98.5	....	0.98	....	0.32	Fe, 0.16
Russian	26.5	1.3	72.2	....	....	
Salge Metal	85.5	4.	9.9	....	1.1	
Schomberg-Bearing	59.4	0.38	39.8	....	0.21	Fe, 0.15
Silver Leaf	8.25	....	91.	....	0.35	
Silver Metal	66.5	....	....	....	....	Ag, 33.5
Siemens Halske	48.	....	....	5.	....	Cd, 47.
Siemens Halske, Automobile	47.5	....	....	5.	....	Cd, 47.5
Sorel's Alloy	98.	1.	....	....	....	Fe, 1.
Sorel's Alloy	88.	10.	....	....	....	Fe, 10.
Spiauter (Hard Zinc)	90.	2.	....	8.	....	
Vaucher's Alloy	75.	....	18.	2.5	4.5	
Zelco	73.	2.	....	....	....	Al, 15.0

FUSIBLE METALS

	BISMUTH BI	TIN SN	LEAD PB	CADMIUM CD	OTHER ELEMENTS	TEMPERATURE OF FUSION
Anatomical Alloy	53.5	19.	17.	....	Hg, 10.5	60° C.
Bismuth Solder	40.	20.	40.	....		
Bismuth Solder	33.3	33.3	33.3	....		
Bismuth Solder	27.5	45.	27.5	....		
Bismuth Solder	25.	50.	25.	....		
D'Arcet	50.	25.	25.	....		
Eutectic	52.5	15.5	32.	....		96° C.
Eutectic	49.5	13.1	27.3	10.1		70–74° C.
Eutectic	51.6	....	40.2	8.1		91.5° C.
Eutectic	54.	26.	....	20.		103° C.
Eutectic	....	50.	32.	18.		145° C.
Fusible Tea Spoons	44.5	16.5	30.	....	Hg, 5–10	
Guthrie's	47.38	19.97	19.36	13.29		
Lictenberg	50.	20.	30.	....		
Lipowitz	50.	13.3	26.7	10.		
Newton's	50	18.75	31.25	....		
Onion's	50.	20.	30.	....		
Rose's	50.	22.	28.	....		
Rose's	35.	30.	35.	....		
Wood's	50.	12.5	25.	12.5		

This List will be continued in an early issue.—Ed.

EFFECTS OF ELEMENTS ON ELECTRICAL RESISTIVITY

By A. L. Norbury*

In the first part of the Note some new data are given for the electrical resistivities of certain alloys of copper, containing low percentages of each of the following added elements in solid solution: Aluminium, silicon, manganese, nickel, zinc, silver and tin.

From these results and from those obtained by previous investigators, values for the "increase in the electrical resistivity of copper due to the presence in solid solution of 1.0 atomic per cent. added element" are calculated for each of the added elements. The results so obtained show that the "atomic effects" are small for elements like silver and gold—which are in the same group as copper in the Periodic Table—and are progressively larger as the added elements are further away from copper in the Table.

It is suggested, therefore, that the "atomic effects" are large or small according as the "affinity" between atoms of solvent and solute is large or small.

*Abstract of a paper read at the British Institute of Metals, London, England, March 11-12, 1925.

Centrifugal Casting Calculations

Discussion of the Principles Set Forth in "Centrifugal Casting" by N. Lilienberg in "The Blast Furnace and Steel Plant" of July, 1922. A Simple and Practical Method of Applying These Principles to Actual Production of Centrifugal Castings of Brass, Bronze or Other Metals.

Written for The Metal Industry by ROBERT F. WOOD, Metallurgical Engineer, Newark, N. J.

When the axis of a mold for making centrifugal castings is vertical or inclined, the bore becomes paraboloidal instead of cylindrical in shape and has a greater diameter at the upper end than at the lower. The vertex of the paraboloid may lie either within or without the mold.

Casting processes based upon this principle are mentioned in the literature and in numerous patents[1], and the mathematics of the principles in carrying out these processes have been published also from time to time[2]. The methods of calculation as set forth in Mr. Lilienberg's article, appeal to me as more practical and more useful than most of those that have been given.

It is my purpose here to discuss and present these same general methods of calculation in a way that I believe will make them much more readily followed and used.

For practical use, all essential requirements will be covered below in Part III. Before proceeding to this demonstration, however, we shall revert briefly to the article under discussion.

RÉSUMÉ OF MR. LILIENBERG'S PAPER

1. Calculations are given, proving that the inner surface of liquid metal within a rotating vertical mold is a paraboloid of revolution generated by the parabola $Y = \frac{1}{2} K n^2 X^2$, in which n equals revolutions per minute and $K = \pi^2/(g \times 30)^2$, the axis of Y being the axis of the mold and likewise of the casting and of the parabola.

2. For vertically produced castings, in which the vertex of the paraboloid just touches the bottom of the mold, and where the walls of the casting taper out to zero thickness at the upper end, it is found that the length of the paraboloid is $\frac{1}{2}Kn^2r^2$, in which K and n are as before, and r equals the radius of the mold in feet. The speed required to make such a casting, is found to be $n = 108.75 \sqrt{h}/r$, in which n and r are as above, and h is "the line of rest" or computed height to which the given amount of liquid metal would rise in the mold without rotation.

For vertically produced castings the walls of which taper out to zero thickness at the upper end, but made at a speed causing the vertex to pass below the bottom of the mold and become imaginary, the radius of the opening in the casting, at the bottom of the mold, is found to be

equal to $\sqrt{r^2 - 108.75 \dfrac{r}{n} \sqrt{h}}.$

Examples are given, showing the use of these formulas.

For castings whose walls have an appreciable thickness at the upper end caused by the presence of enough metal so that "the rising liquid strikes the cover of the mold," the same kind of calculations are stated to apply, but were considered too lengthy to be given in the article.

3. The casting apparatus described for carrying out the process consists essentially of a cylindrical and readily replaceable metal mold mounted on end upon the upper end of a vertical revolving shaft, and provided with a funnel or spout above its upper end for delivering the molten metal within the mold. The whole is mounted within a vertical framework, by which is supported the entire apparatus, including accessory means of displacing the spout and removing the casting.

4. When using this apparatus it can happen that defects will be caused by "cold splashes," especially if the mold is rotating at full speed during pouring. The best average results were secured by having the mold in slow rotation during the pour, and then bringing right up to full speed, and with the spout arranged so that the liquid

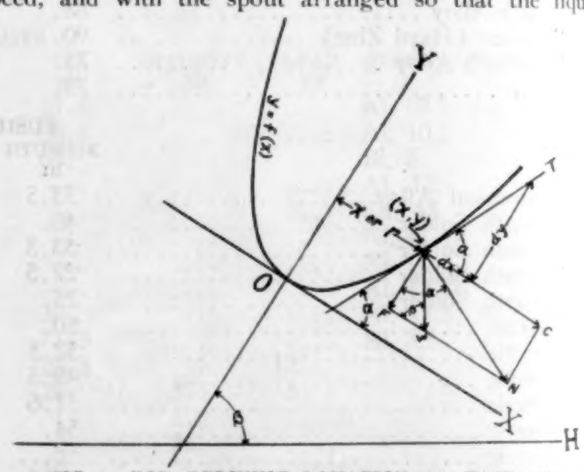

FIG. 1. FOR DERIVING EQUATION (1), PAGE 187.

metal impinged upon the sides of the mold instead of taking a sheer drop to the bottom.

5. Hollow billets and other hollow articles of various metals fall within the practical limits of this process; projectiles, and sleeves for explosion chambers of field guns are given especial mention.

CONTROL OF CENTRIFUGAL CASTING

In our consideration of this subject, we shall derive in Parts I and II certain necessary formulae, and then **show in Part III, how these formulae may be applied easily to practical work in the foundry.**

PART I. DERIVING FUNDAMENTAL EQUATIONS

(a) We shall first derive the equation of the curve formed by a longitudinal or axial cross-section of the bore of the casting, and we shall then express this equation in the forms best suited for carrying out calculations.

Fig. 1 is adapted from Fig. 1, p. 377, B. F. & S. P. of July, 1922; the Y-axis represents the axis of the mold and consequently it is also the axis of the casting and of the bore of the casting; the curve $y = f(x)$ and the point (x, y) are located on the inside surface of the casting.

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[1] (a). U. S. Patent No. 98,673, year 1870, by Davies mentions the "hollow or basin" credited by centrifugal force when metal is poured into a vertical revolving mold. (b). British Patent No. 3819, year 1878, by Taylor and Wailes (registered in U. S. Patent Office); describes the shape of the "paraboloid of revolution" formed by the inner surface of liquid metal when poured into a revolving mold which has its axis vertical or inclined; mentions that at high velocities the casting will be nearly cylindrical. (c). British Patent No. 21,213, year 1894, by Huth (registered in U. S. Patent Office in 1895); mentions the "parabolic curve" formed by the inner surface of the casting when the mold rotates around a vertical axis, and states that " . . . The parabole . . . depends upon the radius . . . and the velocity of rotation." (d). An article by A. E. Fay in "Iron Age," Feb. 28, 1901, discusses the Huth patents and work done by Bessemer and others along the same lines. (e) Patent 839,861, year 1907, by Lilienberg, and other patents relating to same kinds of processes.

[2] (a). "Ueber Zentrifugalguss," by Ernst Lewicki, "Zeitschrift des Ver. Deutscher Ing.," June 25, 1898. (b). "Treatise on Hydraulics," 1903, by Merriman, p. 72. (c). "British Adopt Centrifugal Casting," by G. Williams, "The Foundry," Mar. 15, 1920. (d). "Control of Centrifugal Casting by Calculation," by Robert F. Wood, "Mechanical Engineering," Nov. 1921. (e). "Centrifugal Casting," by L. Cammen, "Transactions" of Am. Soc. Mech. Engrs., 1922, vol. 44, pp. 262, 280-282, also references there given, viz., "Thermodynamics," 1906, by Horace Lamb, p. 24; "Talks on Mechanics," St. Petersburg, 1907, by V. L. Kirpicheff, pp. 94-95.

The Y-axis is taken at any angle, β, with the horizontal, H. As w is the weight of a particle located on the inner surface of the casting at (x, y), it must act vertically downward as shown, and the component parallel to the axis of Y, designated by F, becomes $F = w \sin \beta$. When β is 90 degrees, $\sin \beta$ becomes unity and F and w then coincide. The other component of w, viz. $w \cos \beta$, is inoperative as far as any effect upon the contour of the casting is concerned, because, as the mold rotates, this force pulls the particle alternately towards a horizontal diameter and away from it, and is thus neutralized.

In order to derive the equation of the curve, we use the following notation:

m = mass of particle, w = weight of particle, $w = m/g$,

g = gravity = 32.16, r = radius (in feet) at which C acts,

C = centrifugal force, and acts parallel to X-axis, v = circumferential velocity, feet per second,

$C = mv^2/r$,

n = number of revolutions per second, (Note 3), $v = 2\pi rn$,

α = "slope" at the X-axis of a tangent T to the curve at (x, y),

β = angle of inclination of Y-axis, F = component of w parallel to Y-axis,

dy = differential of y, dx = differential of x,

N = the resultant of the forces acting upon the particle at (x, y), and must be normal to the tangent T at that point.

From the above values and the relations in Fig. 1:

$$\tan \alpha = \frac{dy}{dx}, \qquad \tan \alpha = \frac{C}{F}, \qquad \frac{C}{F} = \frac{C}{w \sin\beta}$$

$$\frac{dy}{dx} = \frac{C}{w \sin\beta}, \qquad r = x,$$

$$C = \frac{mv^2}{x} = \frac{4\pi^2 n^2 w}{g} x, \qquad \text{Let } K = \frac{2\pi^2}{g} = 0.614, \text{ (Note 3)},$$

$$C = 2Kn^2wx, \qquad \frac{dy}{dx} = \frac{2Kn^2w}{w \sin\beta} x, \text{ (Note 4)},$$

From this differential equation we have:

$$\int dy = \frac{2Kn^2}{\sin\beta} \int x dx,$$

and by integration we have the equation:

$$\text{(1)} \qquad y = \frac{Kn^2}{\sin\beta} x^2, \text{ or, } \qquad y = 0.614 \frac{n^2}{\sin\beta} x^2$$

This is the equation of a parabola and is the fundamental relation upon which depends the solution of all problems of the kind under discussion. (No constant of integration appears in the equation because the curve is taken as passing through the origin.)

To put equation (1) into its most general form, let

$$\text{(2)} \qquad M = \frac{Kn^2}{\sin\beta}, \text{ or, } \qquad M = 0.614 \frac{n^2}{\sin\beta},$$

then from (1):

$$\text{(3)} \qquad y = Mx^2$$

Equation (3) is the form in which this fundamental relation will be most easily and frequently used; the determination of the coefficient M by equation (2) will be required occasionally and when $\beta = 90°$, is the same as the determination of $\frac{1}{2}Kn^2$ in the previous article.[3]

Fig. 2 shows how rapidly, as was pointed out by Mr. Lilienberg, the parabola becomes elongated with increasing speed, i. e., with increased value of the coefficient M.

(b) From equation (2) by solving for n there is obtained a useful speed relation:

$$\text{(4)} \qquad n = \sqrt{\frac{M \sin\beta}{K}}, \text{ or, } \qquad n = 1.276\sqrt{M \sin\beta}$$

This relation is used frequently and gives the same speed results as were obtained by Mr. Lilienberg in his illustrative examples on page 376.

(c) Equation (2) gives one method of ascertaining the value of the coefficient M. Below is another and very useful method of ascertaining this same coefficient, independently of n or β.

The original Fig. 4 we shall adapt[5] for this purpose

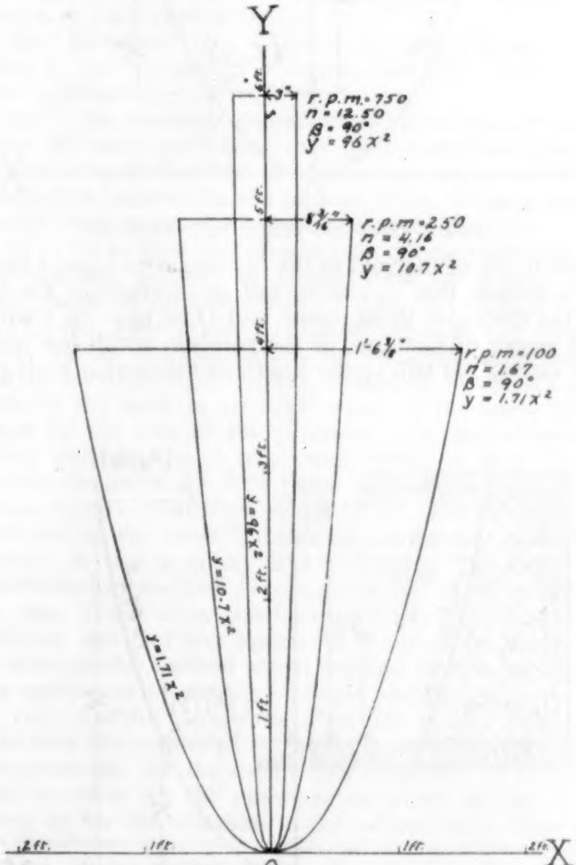

FIG. 2. EFFECT OF COEFFICIENT M UPON SHAPE OF PARABOLA.

in the construction of our Figs. 3, 4, and 5. We shall use the customary notation for points on a curve and denote such points by (x_1, y_1), (x_2, y_2), etc., so that in every case the y value will be the entire distance from the point to the X-axis, and the x value will be, similarly, the distance between the point and the axis of Y, i.e., the axis of the parabola and mold.

[3] In the previous article, n = rev. per minute, which for purposes of computation gives awkward quantities to handle. The numerical value of our "K" is 0.614, and of "K" in the previous article is 0.000341. To illustrate: A typical expression to solve in the previous article is $\frac{1}{2}Kn^2$; with n = 750 the expression becomes $\frac{1}{2}Kn^2 = \frac{1}{2} \times 0.000341 \times 750^2 = 96$. The equivalent expression in the modified notation here used becomes $Kn^2 = 0.614 \times 12.5^2 = 96$. The practical advantage when making computations is self-evident.

[4] The disappearance of w is significant and explains the fact that calculations for speed and for internal shape are unaffected by the specific gravity of the material introduced into the mold.

[5] The changes made in this figure will so simplify the lengthy and burdensome calculations referred to by Mr. Lilienberg on page 376, that they may be made with the greatest ease, as shown in Part III.

The difference between two ordinates y_2 and y_1 measured along the Y-axis is designated by D. Hence by Fig. 3 and by equation (3):

$$(5)\ D = y_2 - y_1 = M\,(x^2_2 - x^2_1);\ \text{or, } M = \frac{D}{x^2_2 - x^2_1}$$

By selecting (x_2, y_2) on the parabola at the upper extremity of a casting and (x_1, y_1) on the parabola at the

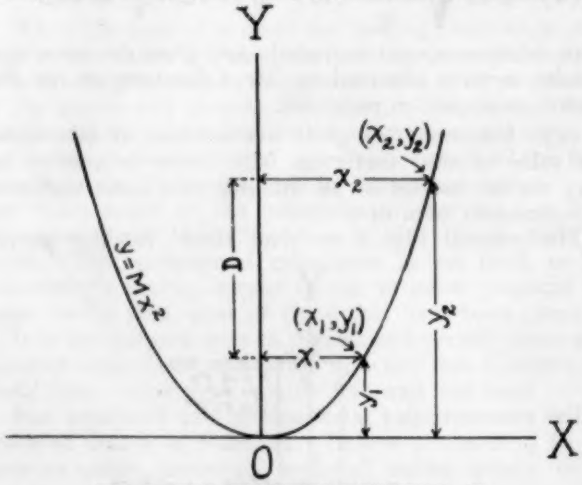

FIG. 3. FOR DERIVING EQUATION (5).

bottom end of the void in the casting, as in Figs, 4 and 5, it is evident that x_2 and x_1 will be the radii of the bore of the casting at those points, and D or $(y_2 - y_1)$ will be the length of that part of the parabola which lies within the casting; D will be the length of the casting itself pro-

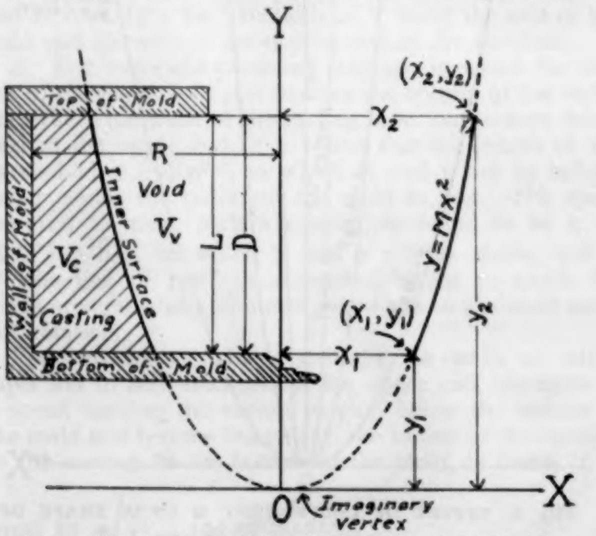

FIG. 4. VERTEX LOCATED OUTSIDE OF THE MOLD.

vided the vertex of the parabola lies at or below the bottom of the mold, as in Fig. 4.

By comparing the terms in which M is expressed in equations (2) and (5), it will be seen that we now have two alternative means of ascertaining the value of that coefficient for the formation of the necessary equation (3) in any concrete case; the given conditions in any problem will indicate whether equation (2) or (5) may be the more advantageously employed.

PART II. DERIVING VOLUME RELATIONS

(a) The volume, V_m, of a cylindrical mold of radius R and length L is:

$$(6)\qquad V_m = \pi R^2 L$$

For molds not cylindrical, formulas appropriate to the shape of the mold must be used, of course, in determining V_m.

(b) The volume, V_v, of the void in the casting is the volume of the frustum of the paraboloid included within the bore of the casting (see Figs. 4 and 5, and note 6).

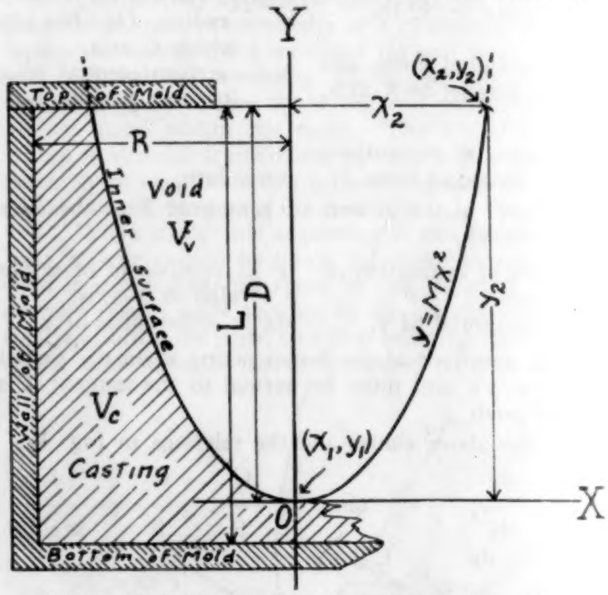

FIG. 5. VERTEX LOCATED INSIDE OF THE MOLD

By standard methods for the volume of solids or revolution we have:

$$V_v = \int \pi x^2 dy$$

By equation (3) we have $x^2 = y/M$, and since the volume is desired from y_1 to y_2 we have:

$$V_v = \int_{y_1}^{y_2} \pi \frac{y}{M} dy = \frac{\pi}{M} \int_{y_1}^{y_2} y\, dy$$

$$(7)\qquad V_v = \frac{\pi}{2M}(y_2^2 - y_1^2)$$

If the vertex lies within the mold this formula applies equally well; y_1 simply becomes zero, as in Fig. 5.

(c) The volume, V_c, of the casting will be the total volume of the mold less the volume of the void left therein, or:

$$(8)\qquad V_c = V_m - V_v$$

This also is universal in application; see Figs. 4 and 5.

PART III. PRACTICAL APPLICATIONS OF THE ABOVE CALCULATIONS

(a) When "the rising liquid strikes the cover of the mold" so that the upper end of the casting does not come to a feather edge but has a certain wall thickness, it is true, as Mr. Lilienberg states, that it is possible to use his calculations to solve such problems. The simple device given in equation (5) will bring the same results however, and will make far lighter work of all such cases, since it is unaffected by any consideration of wall thickness in any part of the casting or of location of the vertex of the parabola within or without the mold, and the calculation is made in every instance with equal facility. As it appears self evident that problems of this type would be those commonly met with, an example is given below. Problems such as this constitute, in fact, the "general

*In the previous paper the relation is used, that "the volume of a paraboloid is ½ of the circumscribed cylinder," but this holds good only "as long as the apex stays inside of the mold." The formula which we here derive holds good in all cases regardless of the location of the apex or vertex of the paraboloid.

case," hence the methods used in solving them apply equally well to cases in which there are special conditions or values for wall thicknesses or for location of the vertex.

(b) Given a vertical mold 8 inches in diameter and 8 feet long, find the equation of the parabola and the speed at which the mold must revolve to make a casting with a wall thickness of 1 inch at the upper end and 2 inches at the lower end.

The radii of the holes in the two ends will be 3 inches and 2 inches respectively, hence (see Fig. 4),

$x_2 = 3/12 = 0.25$ ft., and $x_1 = 2/12 = 0.167$ ft.

We have also, D = 8.0 ft.

All dimensions must be expressed in feet.

From equation (5):

$$M = \frac{D}{x^2_2 - x_1^2} = \frac{8.0}{0.25^2 - 0.167^2} = 230$$

By equation (3) therefore this parabola is $y = 230\,x^2$.

From equation (4) $n = 1.276\sqrt{M \sin\beta}$, and since $\beta = 90$ degrees[7] we have:

$n = 1.276\sqrt{230 \times 1} = 19.35$ revolutions per second, which equals 1160 r.p.m. **This is the speed required to make the given casting.**

(c) Find the speed that would be required to make the same casting, if the mold instead of being vertical were inclined at 40 degrees to the horizontal.

Here the equation of the parabola remains the same, since D, x_2, and x_1 have not changed, but the equations show that a different speed will be required to maintain the same parabola. Hence by equation (4):

$n = 1.276\sqrt{230 \times \sin 40^\circ} = 15.51$ revolutions per second, which equals 930 r.p.m.[7]

(d) Find the position of the (imaginary) vertex.

From $y_1 = 230\,x^2_1$ and $x_1 = 0.167$ we have:

$$y_1 = 230 \times 0.167^2 = 6.38 \text{ ft.}$$

Therefore the vertex is 6.38 ft. below the bottom of the mold. The position of the vertex can be obtained also as follows:

$$y_2 = 230\,x^2_2, \quad x_2 = 0.25 \text{ ft.}$$
$$y_2 = 230 \times 0.25^2 = 14.38 \text{ ft.}$$

Therefore the vertex is 14.38 ft. below the top of the mold. This checks with the condition in equation (5):

$$D = y_2 - y_1 \text{ or, } 8.0 = 14.38 - 6.38$$

(e) Find the volume of the casting.

[7] For the numerical value of the sine of any angle, such as sin 90°, sin 40°, etc., consult a table of Natural Sines, to be found in most mechanical handbooks.

By (6), Vol. of mold $= V_m = \pi R^2 L = \pi \times 0.333^2 \times 8.0 = 2.793$ cu. ft.

By (7), Vol. of void $= V_v = \dfrac{\pi}{2M}(y^2_2 - y^2_1)$

$$V_v = \frac{\pi}{2 \times 230}(14.38^2 - 6.38^2) = 1.133 \text{ cu. ft.}$$

By (8), Vol. of casting $= V_c = V_m - V_v = 1.660$ cu. ft. **Hence this quantity of metal must be introduced to make the casting.**

(f) Further applications of these same principles, but under different notation, were given in "Mechanical Engineering," November, 1921[2].

PART IV. SUMMARY AND REMARKS

(a) Equations (2), (3), (4), and (5), will solve practically all paraboloidal bore problems in centrifugal casting, and are not restricted to any kind of special conditions in their application.

(b) Equations (6), (7) and (8), for the amount of metal to use in making a casting, are also universal in their application.

(c) The equations and solutions given here are based upon the same principles that have been developed by several others, but the method of presentation herein adopted is believed by the present writer to have greater clarity, with more brevity and ease of computation.

(d) In at least one proposal for a centrifugal casting process, and possibly in others, these underlying principles have not been observed. I refer to part of a patent (U. S. No. 538,835) by S. L. Kneass in 1895, in which is described an intended means for producing truly conical shapes by centrifugal casting, consisting of elevating the axis of the mold at an angle equal to the angle of the slope of the side of the proposed cone-shaped product. Here the centrifugal force was depended upon to distribute and hold the fluid metal against the walls of the mold, but its effect as a potent factor in determining the contour of the inner surface of the casting (which of course is not a cone) was completely ignored. The mathematical analyses herein given and those referred to in Note 2 will show conclusively the fallacy of any such scheme, and that any equipment designed for conducting this inoperable method would fail and have to be replaced by equipment of correct principle and design.

(e) Careful perusal of Part III should make clear and easy the ascertainment of the essential conditions and requirements for the design and operation of equipment for carrying out the processes described by Mr. Lilienberg or for the processes in the references in Note 1.

Protecting Duralumin Airship Parts

The naval airship Los Angeles, formerly the ZR-3, suffered serious injury on her trip to Bermuda in February, 1925.

Several duralumin hull plates have to be replaced. When calcium chloride, used to prevent the water balast from freezing, dripped down on the framework plates of the airship and corroded them.

Since then, methods of protecting the plates have been developed consisting of the application coatings of Spar varnish, enamel or bitumastic.

Diagram of the Aluminium-Zinc System

By T. Isihara*

The results of an investigation on the equilibrium diagram of the aluminium-zinc system are given by Professor T. Isihara, of Sendai, Japan. The research was undertaken to determine a correct equilibrium diagram by means of the electric-resistance method. Microscopical investigation, the dilatometric method and X-ray analysis were used supplementarily.

*Abstract of a paper read at the British Institute of Metals, London, England, March 11-12, 1925.

Tinning Duralumin

Q.—Will you kindly advise whether Duralumin can be tinned? If so, how?

A.—The process of tinning Duralumin is rather a difficult one, but can be accomplished by the following method: Heat the article to be tinned to 400 degrees F., having the surface clean and without any flux. Heat the tin to 800 degrees F., and with the aid of a wire scratch brush, rub the melted tin outo the Duralumin. Where there is much of the work to do, a special pot to contain the tin may be made, with proper bearings to carry a revolving iron brush, with guards to prevent the tin from leaving the tank and also to hold the piece to be tinned.—Tinner.

Streaky Phosphor Bronze Sheet

Metallurgical and Mechanical Methods of Eliminating These Streaks.

Q.—We are having trouble in the manufacture of sheet phosphor bronze, in the casting of sound plates for rolling. Up to 5" in width the plates cast fairly well, but from that width on, we get plates that have a streak of spilly or dead metal up the center of the plate, which when finally finished, gives a surface that strips or peels. This streak begins about four inches from the bottom of the plate when cast, and is generally about one-third of the width of the plate, whether the width 6" or 8", but scarcely ever occurs in plates 5" and narrower. We melt in black lead crucibles, about 165 lbs. per melt.

We use a mixture of 95 copper, 5 tin, with 1½ lbs. of 15 per cent phosphor copper per 100 lbs. of copper and tin. We have varied this mixture slightly both ways without improvement, and have tried adding 1 per cent nickel without result.

We pour in the usual form of iron mould; have poured straight up and slightly inclined; with strainer and without strainer, and at various heats from just hot enough to flow, to practically boiling heat. Moulds are greased with lard oil and graphite. In short we use the same methods used in casting brass and similar alloys for rolling, but we have been unable, so far, to get away from this bad streak of metal in the center of the plate.

WRONG PHOSPHORUS CONTENT

By Jesse L. Jones

One and one half lbs. of 155 per cent phosphor copper is very much in excess of the amount used by a number of manufacturers. Where a good grade of electrolytic ingot copper and pure tin is used, together with careful melting, ¼ to ½ lb. of the 15 per cent phosphor copper should be sufficient for deoxidation. Any excess over what is required to de-oxidize the mixture is likely to cause the formation of dross and the streaks in question.

The fact that the trouble seldom occurs in plates of 5 inches width and narrower, but in those that are wider than 5 inches, suggests that a strainer gate that would pour into the mold two streams of metal, that would be equivalent to what would regularly be poured from two crucibles, might be a decided advantage.

USE OF A SPLITTER

By W. J. Pettis

A.—The light streak through the center of the bar is due to uneven cooling of the metal after pouring in the moulds. The metal chills faster at the edges of the mould and the chilling slows down towards the center. The result is a fine crystal formation at the points where the chilling is fastest, and a coarse crystal formation where the cooling is prolonged, as in the center of the mould. In the five inch mould the rate of cooling through the cross section of the bar is fairly uniform, and that is about the maximum width that will give this result. The trouble increases with the increase in the width of the mould.

The remedy lies in the method of pouring. A wide "splitter" is used and the steam is split so that the two streams will enter the mould near each edge, in good volume. The pour should be rather fast and the metal should be hotter than in pouring the narrow metal (but not boiling heat). This will prevent the metal from chilling too fast at the outer edges and allow a more uniform cooling throughout the bar.

The moulds should be slightly inclined. Your method of dressing the moulds is the best standard practice. If your casters are not accustomed to pouring with a "splitter" you will experience some trouble in getting good edges, but the structure will be sound.

Resharpening Files

Q—Can you furnish us with a formula or method of resharpening files with an acid solution?

A—To renew old files wash in a strong solution of lye and water. When washed, clean them with a wire brush; then sort them according to the coarseness of the teeth and the amount of wear. Make a solution from a mixture of one part of 38 per cent nitric acid, one part of 66 per cent sulphuric acid and one part water. Before putting the solution in a tank put pieces of wood under the files on each layer so that the solution can play around them or string each one on wire and suspend in solution.

The length of time required for renewing files is as follows: Fine files from 8 to 10 minutes; medium files from 10 to 15 minutes; coarse files from 15 to 20 minutes. Those very much worn will require longer time. After taking out of the solution wash in clear water and dry. The files should then be brushed with a mixture of olive oil and turpentine.—P. W. Blair.

Rubber Coating Wire

Q.—How is rubber insulation coated on copper wire?

A.—The copper wire is placed in the center of what is called a nipple which is attached to the machine holding the rubber and other insulation. The wire is pulled through the nipple and the rubber is extended by pressure at the same speed as the wire travels, thus coating the wire. It is later vulcanized to the wire which makes it permanent.

Another method is to have the rubber in strips. Place it around the wire and then vulcanize it.—W. L. Abate.

Spring Brass

Commercial spring brass is made from "common high brass" 64 per cent copper, 36 per cent zinc. The temper is obtained by the physical working of the metal. A reduction of 6 to 8 numbers (B & S gauge) in the finishing rolling of the brass, gives it sufficient temper for purposes where flat springs are used.

Where greater strength is required a variety of alloys are used depending on the service required; among them are the following:

63% copper—37 zinc—1 tin.
67% copper—32½ zinc—½ tin.
86% copper—10 zinc—4 tin (spring bronze).
61½% copper—20½ zinc—18 nickel (Nickel silver).

Spring brass as above, is produced by the rolling mills, and the quality depends upon the amount of reduction at the finished rolling.

The bars are cast in iron molds, 1⅛ in. thick and 6 in. to 12 in. wide in units of 100 lbs.; rolled down to the required gauge, and slit in whatever width is ordered.

We know of no alloy that could be produced in the foundry without subsequent working that would have the resilience to make good springs.—W. J. Pettis.

Corrosion of Metals

Abstracts of a Symposium of the American Chemical Society, Baltimore, Md., April 6-11, 1925.

CORROSION STUDIES AND THE ELECTROCHEMICAL THEORY

By F. N. Speller

Explains the modern Electrochemical Theory which has withstood the test of time and which, as now interpreted, seems to account for all known corrosion phenomena. Divides water corrosion into three zones: acid, neutral, and alkaline; points out the causes and effects of the factors responsible for localized corrosion (pitting) and their relationship to ordinary corrosion. Pays particular attention to the pitting caused by dissimilar metals and dissimilar solutions in contact. Corrosion in the absence of dissolved oxygen, and the pitting of homogeneous metal, are also explainable under the Electrochemical Theory.

ACCELERATED CORROSION TESTS OF COPPER-ZINC ALLOYS BY SALT SPRAY

By W. H. Bassett and H. A. Bedworth

Corrosion tests of a series of commercial copper-zinc alloys by an accelerated salt spray test and immersion tests in sea water, extending over a period of ten years, have shown that alloys containing between 70 and 85 per cent copper are best adapted to resist salt water corrosion.

Results obtained by accelerated spray tests were in excellent general agreement with effects produced by long-time immersion tests in sea water.

The procedure and results of the spray tests are described in some detail, and the relation of duration of tests to results obtained is discussed.

THE ACID CORROSION OF METALS EFFECTS OF OXYGEN AND VELOCITY

By W. G. Whitman and R. P. Russell

The first half of the paper presents an experimental survey of the effect of dissolved oxygen in the corrosion of steel, aluminum, lead, copper, nickel, tin and several alloys by sulphuric, hydrochloric, nitric and acetic acids. The method used was to compare the corrosion rates in two solutions, one of which was saturated with oxygen and the other with hydrogen.

The second half deals with the effects of velocity on the corrosion of copper by sulphuric acetic and hydrochloric acids and on the corrosion of steel by concentrated sulphuric acids. An apparatus in which the samples are suspended in the acid from a horizontal rotating wheel was used, and provision was made for air saturation or for total exclusion of oxygen.

The results emphasize the importance of oxygen in corrosion by dilute non-oxidizing acids. They also show that dissolved oxygen may act as a passivifying agent in some cases, thereby actually reducing corrosion. Velocity increases corrosion when oxygen is a vital factor, and also markedly accelerates corrosion where protective films may be removed.

SPECIAL CORROSION PROBLEMS IN OIL REFINING WITH PARTICULAR REFERENCES TO SULFUR CORROSION AT HIGH TEMPERATURES

By R. E. Wilson

This article describes specialized corrosion problems encountered in the petroleum industry.

In "fire and steam" distillation of crude oils most of the corrosion is caused by the hydrolysis of $MgCl_2$ in the salt which is almost always present. This causes rapid corrosion in all parts which come in contact with the condensed water containing HCl and apparently some other corrosive compounds. Methods of preventiing or minimizing this corrosion are discussed. Nickel-chromium or high chromium steels and some special bronzes stand up rather well, while ordinary steels are very poor.

In cooking distilations of crude, or in cracking stills, the most severe corrosion occurs in the parts of the apparatus above 600° and is due to H_2S and probably other corrosive sulfur compounds. Under these conditions the chromium ("stainless") steels, aluminum and calorized iron stand up remarkably well, while copper and some bronzes are much worse than ordinary steels. Monel has no advantage over steel under these conditions. The addition of lime to pressure steel charging stock markedly reduces but does not stop corrosion.

THE CORROSION OF SOME CAST ALUMINUM ALLOYS AND A METHOD OF PROTECTION

By A. C. Zimmerman

Difficulties which have been encountered due to the corrosion properties of aluminum alloy parts when used in the fuel systems of aviation engines are briefly referred to. The procedure and results from a series of tests to obtain alloys which would reduce the corrosion to a minimum and protective coatings which would practically eliminate it are outlined in detail.

The silicon-aluminum alloys were found to be the most resistent to water corrosion, and a sodium silicate or water glass treatment gave the best results as a protective coating. The water glass treatment answers a two-fold purpose in that it not only inhibits corrosion but also reduces the porosity of the casting. It is now used extensively by the Air Service for the protection of cast aluminum parts which are exposed to corrosive media.

THE OXIDATION OF COPPER-NICKEL ALLOYS AT HIGH TEMPERATURES

By N. B. Pilling and R. E. Bedworth

The oxidation of the copper-nickel series of alloys at high temperatures has been investigated. The addition of nickel to copper in amounts up to 30 per cent, and of copper to nickel in amounts up to 20 per cent cause specific changes in oridation rate, but is without effect on the mechanism of the oxidation reaction, which resembles that of simple metals. In the intermediate range of alloys the mechanism of the oxidation reaction is essentially different from the simple cases, in a way which has not been fully deciphered.

Certain dilute alloys of nickel in copper oxidize faster than copper; no alloys were found which were superior to nickel in the higher ranges of temperature. An alloy of 60 per cent nickel showed definite evidence of oxidizing less than pure nickel at temperatures below 750°C, and may have application in special circumstances.

THE EFFECTS OF RUST PREVENTIVE COMPOUNDS ON POLISHED SURFACES

By F. E. Woodward

Describes the etching effect of several rust preventive compounds as distinct from their rust prevention properties. Gives results of tests of rust preventive compounds on metals, and microphotographs of surfaces before and after testing. Tests made with and without exposure to weather, and with and without light. The acidity of a protective grease should be low and its chemical composition simple. The grease should form a thin film, which does not "slip" at 100° F.

Plating Problems I Have Met

Plating Troubles in Copper, Silver, Zinc and Nickel Solutions, and How They Were Overcome. A Paper Read at the Annual Banquet of the Newark Branch, American Electro-Platers' Society, April 25, 1925

By CHARLES H. PROCTOR
Plating-Chemical Editor, The Metal Industry

If a plater or electro-chemist believes for one moment that all the problems in the deposition of metals have been solved then he must have reached his limit in the commercial electro-plating industry. However, as this is not true, and never will be true, the answer is to journey with me on some of my travels. I am going to mention a few problems, picked at random. To the firms that had them they proved decidedly costly.

PROBLEM NO. 1 COPPER ON AUTOMOBILE HEADLIGHTS

A middle western firm manufactured over 5,000 automobile headlights per day. The reflector was made of steel, and had to be copper plated after a smooth surface had been obtained by automatic polishing, to produce a high lustre for the nickel and silver plated finish. They had been getting excellent results for years by standardized methods of upkeep and electrical control of the solutions; analyses were also made of the solutions to check them up. During one whole week they were unable to throw the copper into the apex of the reflector, and even when the copper did deposit, it would be removed in the coloring operations, indicating deposition of hydrogen and copper. Solutions were analyzed and found O. K. Current conditions were thoroughly gone over; cleansing was checked up; the generator was thoroughly examined, and found O. K. Yet the condition continued. It was noted that the voltage increased and the amperage decreased. Additions were made to the solutions, both of cyanides and metal, but with no change in results. Reducing factors were added and still the condition continued. The tank conductors were increased in diameter to overcome resistance. This condition continued for a week; the labor of 40 polishers and platers amounted to nil. I happened to reach the city on the Saturday night. On Sunday morning, (as is my custom) I called up my friend, the manager of the plant, at his home, and was told that he was at the plant. He told me all their troubles, over the phone, and I went out to the plant. They had finally decided that in some manner the materials furnished them were at fault. I decided differently.

In this particular instance, knowing the facts as I have related them, what additions would you have made to the solutions to correct the condition, when apparently all other additions made, had failed? Consider all the facts. Does it not indicate that it was the internal resistance of the solution that had decreased the throwing power? You know we have heard a good deal about throwing power on flat surfaces. What alkaline factor can you add to water that will give the greatest conductivity to it?

These solutions reminded me of an automobile or a power driven machine that would not move. Yet there was only one factor lacking, all other factors being satisfactory, and that was **Lubrication.** So, that Sunday morning, I added to each gallon of solution 1 oz. of sodium hydroxide, stirred each of the 12 copper solutions thoroughly and awaited results on the Monday morning. That one ounce per gallon of sodium hydroxide decreased the internal resistance so that the copper ions would flow normally. In other words, they had become lubricated. The results were immediate and with other additions that had been previously made, a greater current density was carried per tank unit than before. From that time until the present, they have had no difficulty with their copper plating conditions.

Many times during the war when it was difficult to get cyanides, I helped firms to operate their solutions for a period, by additions of small amounts of sodium hydroxide at intervals until the cyanides arrived. This additon works with solutons of the cyanide type, except silver solutions.

PROBLEM NO. 2. SILVER ON STEEL KNIVES

I met a similar problem several years ago with a 400-gallon silver solution that had recently been prepared for plating steel knives. The solution was erratic; the deposit was hard. The silver seemed to deposit on the top part of the knives and dissolve toward the bottom. No similar trouble had ever occurred before excepting minor conditions that result with new silver solutions. Additions had been made to overcome the trouble without results. I happened to call on this firm and the matter was brought to my attention and discussed. It seemed to me that if the internal resistance could be increased, then the correct voltage and amperage for deposition would take care of itself and a satisfactory deposit result. What was the factor? The addition of bisulphite of carbon to a silver solution will allow higher current densities to be carried than in solutions without its addition. I prepared a solution of bisulphite of carbon by dissolving carbon in sodium hydroxide and water until a clear solution resulted. The solution was heated by the aid of a boiling water bath, far removed from any flame that might cause ignition. I used 1 oz. of carbon to 8 ozs. caustic soda and 1 pint of distilled water, or about 1 grain of carbon per gallon for the silver solution. The solution was thoroughly mixed in the silver solution in the evening. The next morning the solution gave normal results and no more difficulty resulted.

PROBLEM NO. 3. CYANIDE COPPER SOLUTION

A few years ago I was called in conference with two firms, one in Connersvile, Ind., and the other in Shelby, Ohio, both doing copper plating on an extensive scale with hot copper cyanide solutions. Both of these firms reported that they could no longer keep helpers in the plating department, due to gases emanating from the solutions. The men, the doctor stated, were suffering from inflammation of the mucus membrane which was directly due to the poisonous cyanide gases. The diagnosis of the case was enough to scare anyone, so they lost all their help except one or two of the older men. Both firms had practically the same condition. Naturally, as they had never experienced anything similar before, "the materials used must be the cause."

I immediately went to Shelby, Ohio, and spent an hour or more in the plating department with my nose constantly in contact with the gases, to determine whether the results were real or only imaginative. I found that they were real. That night my eyes became inflamed,

tears ran constantly. I sneezed every second. It was apparent to guests in my hotel that I had a very serious case of the grip, and they kept away from me.

Now, the water in this section is impregnated with iron. You can see the iron rust everywhere along the banks of the streams. My first thought was that the iron in the water created a condition in the solution, resulting in an excessive evolution of gas from the solution. The copper deposit was normal. It occurred to me that the gases were a combination of cyanogen and hydrogen. It was 4 o'clock when I reached the plant, giving me one hour to think and act on the condition. My first thought was to bring around a cuprous copper condition; possibly then the cyanogen gas condition would be controlled. So I added sodium bisulphite, 1 oz. per gallon. The solution was thoroughly stirred. I noticed the gases were considerably less and did not seem to have the sting. I then decided to try and control the excessive hydrogen evolution with an alkali, so I added 1 oz. or more of soda ash which was also thoroughly stirred into the solution. The results were as if a magician had said, "Presto, change." The gases stayed down in the solution and no further trouble resulted. It was a relief both to the firm and myself but that same night and for two days afterwards I suffered as the helpers had.

Shortly after that a similar condition developed in Connersvile, Ind., and, knowing the remedy, the cure was applied. Last summer a well known firm in Cleveland, Ohio, which operates bronze solutions of 1,200 gallons capacity each, had similar trouble in one tank only. For several weeks, they had operated several electric fans to blow the gases out of the windows. It was satisfactory when the wind was in the right direction, but when it blew in from the windowside, the gases came back in again. Similar remedies were applied and the trouble was overcome. The true cause of such developments is still problematical, like many other problems.

PROBLEM NO. 4. ZINC ON AUTOMOBILE RIMS

A very unusual problem presented itself in Cleveland in November, 1921. A very large manufacturer of automobile rims, whose output ran up to 10,000 Ford rims per day, was advised by the manufacturer who purchased the rims, that after a certain date all rims would have to meet their specifications which called for the minimum amount of zinc to be deposited per square foot of the rim area. The deposit would have to be uniform as all rims would be subject to the 20 per cent salt spray test. The deposit must not break down at any point of the rim in less than 48 hours' exposure to this test.

The rim manufacturer in question and another firm in the same city received the specifications. They looked on them as a joke and evidently intended to forget them. They had never heard of such a thing, so they proceeded as before. At that time all automobile rims were plated in zinc sulphate solutions. The time for the enforcement of the specifications had arrived. In the meantime during the lapse period, the wheel firms had accepted about 10 carload shipments of rims without any comment. A four carload shipment was made after the date when the specifications became operative, and upon receipt about ten days later, and tests were applied to the rims as specified. The rim manufacturer was notified that the rims had been rejected, not being up to specifications, and were being returned at the rim manufacturer's expense.

All was chaos at the rim plant. They tried to improve the conditions without results. A communication reached me and conditions were explained. In the meantime a few weeks previous, I had developed the now well known zinc-mercury solution, by additions of mercury to the solution, (which was later patented), as well as the zinc-mercury anode. It was decided to replace the acid solutions with this type of solution. For the first time in the history of plating a solution was installed for commercial zinc plating with mercury additions. Production commenced, the wheel firm's inspectors were called for and all rims passed inspection. At that time the hydrogen spot test was used as a check-up by measurement of the hydrogen gas in cubic centimeters that resulted in a vacuum by reduction of the zinc with a 50 per cent solution of hydrochloric acid and water. The firm in question was then again on easy street and they were able to meet every specification.

The other producer of rims in the same city had to do likewise to meet the specifications submitted to them. We did not know as much about the value of the zinc-mercury deposit at the time as we do today, so there a joker appeared, when everything seemed to be lovely and sky blue. About the third week after the installation of the solution, two carloads of rims were shipped. At the time of shipment much rain and damp weather came along. The rims were O. K. when put in the cars and had met every test, but ten days later when the rims arrived at the destination and the cars were opened, every rim was covered with a white slimy mass. The rims were all rejected. The rim firm was notified, and the manager visited the wheel plant and was able to verify the statements as to the cause of rejection. He immediately wired to his firm to stop plating operations with the improved zinc cyanide solution.

I was in Detroit at the time, and on my visit to the plant and after a thorough examination of conditions and rims that had been plated that day, a conference was held with the manager and officials, as to the cause of the difficulty. From an analysis of the deposit, I had made during the day, I was positive that the deposit or the solution was not at fault, and so stated at the conference. I agreed to visit the Michigan wheel plant with the manager to inspect the rims. When we arrived the next morning, the cars were in transit back to Cleveland again. I was so sure of my ground that I ordered shipments to be resumed at once to the rim firm, assuming all responsibility. I did however, state positively that the cars must be thoroughly inspected, and must be dry before the rims were placed therein. In the meantime, shipments continued and passed inspection. I awaited with much interest the arrival of the returned cars. What I had surmised had actually occurred.

What occurred in transit to cause such a condition as noted? I picked up a little crystal in the cars on their return, and tasted it. The answer was in that crystal. It was a rock salt crystal. The cars had been used for conveying salt and due to excessive moisture, and possibly humidity at time, the wood had become impregnated with the salt as a solution with the moisture. We all know how salt absorbs moisture. I mentioned that the weather was very wet and damp at the time the rims were shipped. During the ten days transit of the rims to their destination, a sweating had taken place in the closed car. The moisture resulting, was laden with salt so a ten-day salt spray played on the rims and produced the white slimy condition which caused the rejections. The white slime was nothing more than a damp wet coating of zinc chloride that actually results when the salt spray test is applied to zinc plated steel or iron surfaces.

PROBLEM NO. 5. NICKEL PLATED BRASS

A very large manufacturer of hardware in the middle west, one of whose products is nickel plated brass hinges for the refrigerator industry, which also includes the nickel plating of cadmium plated steel hinges, finally decided that they could plate this product and other sim-

ilar products more efficiently, more uniformly and more economically with a complete mechanical unit that would automatically cleanse, wash, nickel plate, wash and dry the product in one continuous operation. In a discussion at the plant, I explained my ideas for such a unit. Finally their engineers submitted plans covering the building of the unit. Some changes were suggested and finally the unit was built and ready for operation. I was asked to write up all the detailed formulae covering the cleansing, solutions, etc. It was estimated that 48,000 hinges could be plated per day by the aid of three girls to frame up the product, unframe the product, and place the plated product in boxes.

Operations were commenced and the results met all expectations for a week. Then a pitting problem of a serious kind resulted, both on brass and cadmium plated steel, and uncoated steel hinges. The plater in charge had never run into any pitting before. In fact he had never seen any pitted articles from using ordinary still solutions that required 45 minutes to give the nickel deposit required. In the mechanical unit the time of plating was 8 minutes. Not knowing differently, he decided that his trouble was due to imperfect cleaning.

So a representative of a cleaner manufacturer was called in. He decided that the trouble was due to a faulty cleanser. (Unfortunately I had given the original cleaner.) The new cleanser was installed. Same results. It was decided later that this cleaner was not adapted for the unit, so other cleaner representatives were called in. Same story. And so matters continued until four cleaners had been installed with same results. The management decided that the trouble was not due to the cleanser so put the original type of cleaner back in the tank again. In the meantime I was asked to confer with them. I was in Milwaukee attending the convention, so the letter did not reach me at once. The next week I was interested to know the results that had been obtained, so I went to Illinois and made my call, when I was confronted with conditions I have mentioned. I decided immediately that the real cause of the pitting was hydrogen. The plater still could not satisfy himself that this was true but said, "I hope you are right."

It was the first time that I had made use of sodium perborate to produce hydrogen peroxide solution for elimination of pitting. The nickel tank was of 1,000 gallons capacity. I figured that 5 lbs. of sodium perborate dissolved to a clear solution in warm water would be ample. The perborate was dissolved in 5 gallons of water at 120° F. and was acidified to the pH of the nickel solution with pure hydrochloric acid. One fourth of the total amount of hydrogen peroxide solution so prepared was first added to the 1,000 gallon solution. However, it required the full 5 gallons to eliminate the pitting entirely but it did accomplish its purpose. Now, every day possibly, half a pound of sodium perborate prepared as outlined is added. No more pitting has resulted. In my opinion, this method is the most efficient method to use. The solution can easily be prepared and always insures a perfectly fresh solution of hydrogen peroxide which is essential in eliminating hydrogen pitting.

Silver and Copper Finish

A combination of silver and copper generally looks well. As an example, a pin tray with a fluted edge could be touched over on the rounds of the fluting with the silvering paste, and when lacquered with colorless liquid celluloid, would last a long time. The raised parts of other articles could be treated the same, but this is a treatment best reserved for lacquered goods, as the silver coloring, being thin, is soon rubbed through with wear.

A cheap paste for this purpose is made in the following manner. Take 50 per cent of prepared chalk, 44 per cent of hyposulphite of soda, and 6 per cent chloride of silver, adding enough water to make into a cream-like paste. This paste can be used with a felt bob on a lathe to whiten any part of the article, or may be employed for hand work by means of a piece of cork, which does not waste the silver.

Only quite small articles can be silvered all over this way profitably, larger goods being better colored by tinning, or by a simple immersion solution. Nothing should be silvered all over to rub through for relief, as on copper, which would too obviously suggest damaged goods, but judiciously done silver on copper would be efective and pleasing—ELECTROGRAPHER.

Old Gold Finish

A very pleasing variation of this, is old gold finish, which is simple and easy to apply. The solution for this is made by dissolving 4 oz. of bichromate of potash in each quart of water, slightly acidulated afterwards with vitriol. If the stair rods or other brass goods are left in this after the usual cleaning, they assume a beautiful dead gold appearance. They are at once plunged, on withdrawal, into a 10 per cent solution of sulphuric acid, rinsed in clean water, and dried out in warm sawdust. To get this finish to perfection it is necessary to bring the articles to a fairly bright polish, and then to tone down with the scratch brush or, preferably, two—a medium and then a fine one—before the immersion in the solution.—ELECTROGRAPHER.

The Practical Use of Corrosion Tests

By W. E. PRATT and J. A. PARSONS*

The type of corrosion data furnished on typical acid-resisting metals is tabulated and conclusions drawn as to the inadequacy of present information and the desirability of additional work on tests and standardization of methods. The possibility and value of standardizing laboratory corrosion tests are shown and a description given of an apparatus and method of testing which have proven satisfactory.

The use of accelerated tests in metallurgical control work is shown to be practical under certain conditions and the deviation of results of accelerated tests from those of long experience is explained by the electrolytic theory. This explanation is ilustrated by data.

Typical corrosion curves are given showing:

a—Initial losses at higher rate than constant loss after 24 hours.

b—Error in predicting life of apparatus based on accelerated tests.

c—Use of constant loss rate in approximating depth of corrosion on penetration in inches per year.

d—Establishment of factor to interpret the short accelerated test to the results of the constant loss rate of corrosion.

Accelerated corrosion tests are practically applied to show (a) the effect on corrosion by changing the physical properties of the metal, and (b) the effect on corrosion by changes in the chemical composition of the alloy.

*Abstract of a paper at the Baltimore Meeting of the American Chemical Society, April 6-11, 1925.

Meeting of the Newark Platers

On Saturday, April 25, at 3 P. M., the Newark Branch of the American Electro-Platers' Society held its Seventh Annual Banquet and open educational session in Stetter's Hall, Newark. The educational session, which convened at 3 P. M., was one of the finest ever held, the papers being of the highest type. The meeting was opened by President Roy Stout, with a neat address of welcome, after which he turned over the chair to S. R. Taylor, librarian. The first speaker was Charles H. Proctor, Founder of the Society, and plating-chemical editor of THE METAL INDUSTRY, whose topic was "Some Plating Problems I Have Met." This paper is published in full on page 192 of this issue. Abstracts of other papers are given below.

CLEANERS

By A. P. MUNNING, 2ND.

The speaker, after first subdividing plating into its various parts and processes, concentrated on his special subject, Alkaline Cleaners. Alkaline cleaners act in three ways: (1) Saponification, (2) Emulsification, (3) Adsorption. Saponification is the manufacture of a soap by the addition of strong alkali to fat. The soap removes the dirt, and can itself be removed by water. Emulsification is the dissemination into bubbles of the oil or wax to be removed. The smaller these bubbles are made the more effective is the cleaning solution. The alkaline cleaner performs this operation and its effectiveness is gauged by the extent to which it reduces the sizes of the grease and oil bubbles. However, these bubbles should not becomes so small as to fix the solution or make it stable because they must be large enough to rise to the top of the solution, in order that they may be skimmed off, leaving the solution free for further cleaning work.

Adsorption is the affinity of grease bubbles for particles of dirt on their surfaces. These particles of dirt keep the bubbles from coalescing, or getting together, and thus makes the cleaner effective. The solid materials or "fillers" found in various cleaners are therefore valuable because they prevent the grease from coalescing, and also act as abrasives. They must not be too large, however, or they will drop out of the solution.

Electric cleaners are like other alkaline cleaners but they must have conductivity. The bubbles of hydrogen which are released by the current, strip the grease from the work and leave the caustic formed free to finish the cleaning operation.

Mr. Munning gave the following advice on the use of cleaning solutions.

1. Heat solution.
2. Agitate solution.
3. Remove dirt from top of solution.
4. Do not leave work in the solution too long.
5. Do not leave work in the electric cleaner too long with the current off. Use high current density.
6. Do not add new cleaner continually to the tank without refreshing solution.
7. Do not add fat. It may make soap but it may also make glycerin, which is harmful.
8. Do not add rosin to the cleansing solution; it may cling to the work, and is difficulty soluble.
9. Do not use too weak or too strong a solution.
10. Do not permit sparking to occur on the work rods.
11. Do not discard a cleaner before using it for at least a day or two.

Mr. Proctor asked when it was advisable to use rosin since some of the cleaners on the market contained this material. Mr. Munning answered that it might be used effectively after it was saponified, but that a readily soluble soap, such as whale oil soap was, in his opinion, much better.

Mr. Munning referred to the excellent work done on cleaners by Baker and Schneidewind, and their paper read before the American Electrochemical Society. A detailed abstract of this paper will be found in THE METAL INDUSTRY for May, 1924, page 184-186.

BRIGHT DIPS AND PICKLES

By GEORGE B. HOGABOOM

Mr. Hogaboom described the problems of pickling and bright dipping. Scale on metals consist generally of several oxides, each of which has different properties of solubility. Although sulphuric acid is the universal pickling agent, hydrochloric acid and salt cake are also commonly used. Hydrochloric acid is better for such substances as nickel steel than sulphuric, because it attacks the scale just as actively, but attacks the metal very much less. For brass it is sometimes advisable to add sodium bichromate to the sulphuric acid. The bichromate changes the cuprous oxide to cupric oxide which is soluble in sulphuric. If the solution is too strong, however, it results in etching rather than a bright dipping effect.

Mr. Hogaboom expressed the opinion that metals should be pickled before bright dipped even though it was generally attempted to combine these operations.

The usual formula for a bright dip for brass is 2 parts sulphuric acid in 1 part nitric acid. Mr. Hogaboom showed, however, that less nitric acid was necessary to obtain the same results and that less fuming and a smoother finish was obtainable. He gave as a formula for a good dip, 75 per cent sulphuric acid; 7.5 per cent nitric acid; .75 per cent hydrochloric acid; balance to be water.

He also recommended the use of soot to stop the fuming of the nitric acid and to eliminate the irregularities in the dipping. Soot makes a bright dipped article come out evenly brightened all over its surface. A concentration of 40°-45° Bé should be satisfactory. Keep the solution cool by placing the container in running cold water.

Mr. Proctor stated that in his experience the soot from furnaces burning hard wood was best. If the brass contained lead, it could be given a good bright dip by first dipping in a strong alkaline cleaner, draining and then immersing in the bright dip solution.

An interesting and practical paper on the Gilding of Watch Cases was read for George Conley by Royal F. Clark. Mr. Wesley O'Leary made a fine address on Vocational Education in New Jersey. Just prior to the close of the meeting, O. J. Sizelove, the instructor of the laboratory courses of the Newark Branch, was presented with a set of silver flatware, as a token of the appreciation and regard of the branch.

After the close of the meeting, the banquet was held, followed by a dance and entertainment. The attendance probably was larger than at any past banquet. The meeting was such as to set a new record for others to shoot at. The branch and the committee are to be heartily congratulated.

Judging Cleaners

Comment on "How Is the Buyer to Know," Published in The Metal Industry for March, 1925

Written for The Metal Industry by EDWARD MAGNUSON, President The Magnuson Products Corporation

Having read with much interest the article by Mr. Blair, published in the March issue of The Metal Industry, it appears that much which was written has merit while certain points stressed do not seem to be justified.

INEXPERIENCED SALESMEN

A point is made that some firms send salesmen into territories without sufficient training. This is perhaps true, but the firms following such a policy will suffer accordingly, as a salesman must be equipped with a thorough knowledge of his products and their uses, otherwise he will be unable to render the service demanded both by customer and employer.

STANDARDIZED CLEANERS

There was a time when the humble candle was the best illuminating agent obtainable, but the inexorable law of progress brought about its replacement, first by oil, then gas and, finally, by electricity. That same law has now, by more improved methods and complicated processes of manufacture, rendered the standardized cleaner more or less obsolete. The increased production made possible by recent improvements must not be hampered by the use of a cleaning material not adapted to the special requirements of such processes.

We agree that this is the age of specialization and standardization, but do not agree that the problem should be made to conform to the standard cleaner. We are firmly convinced that the cleaner should be formulated to meet the special requirements of the process, and the study and experimentation necessary to accomplish this result is, and should be, a part of the service which manufacturers of industrial cleaners should be only too pleased to render to their customers.

SERVICE

Customers are entitled to service, because business would be impossible without them. The word "service" has been stressed and rightly so, but it is undoubtedly the most abused word in the business vocabulary today, notwithstanding the fact that it is the keynote of success in any worthwhile endeavor. Most firms maintain a so-called Service Department, the chief duty of which seems to consist of expediting the delivery of purchased merchandise. As a matter of fact, it should mean a great deal more. It should be deemed a great privilege to be afforded an opportunity to study the cleansing problems of one's customers with a view toward improving methods, increasing production, decreasing the unit cost thereof and the elimination of fire hazards caused by the use of gasoline and other inflammable materials.

It has been my privilege many times to have had the opportunity of working on strange problems in the various branches of the metal trades, often spending weeks of valuable time on experimentation before finally securing satisfactory results. To some it might not appear to have been worth while, but aside from the satisfaction of personal achievement I have always found that the good will thus established was invaluable. One case in particular comes to mind where my services were called on for the purpose of eliminating a fire hazard. Suffice to say the desired result was accomplished and in addition production was considerably increased, while the cost of cleaning was reduced almost to a minimum. This was, of course, very gratifying to the customer and placed an account on our books that it would be extremely difficult for a competitor to alienate. But more than this, it resulted in the discovery of a new cleaning compound.

AGE AND STANDING OF FIRMS

Again, stress is placed upon the age of the seller, and it is, indeed, pleasant to know that the firm one does business with is one having a long, prosperous record of accomplishment, in conjunction with a reputation for fair dealing. But of what value is this if the cleaners they produce happen not to be adaptable to the specal requirements of the buyer? Isn't it true that a firm with such a record behind it must at one time have been of very tender years; and at that time, would that reason have been sufficient to deny them a right to exist and secure a portion of the business extant? Always provided, of course, that they could demonstrate their ability to handle it properly. The age of a firm is not necessarily a guarantee of the superiority of their products.

RUSH ORDERS

Regarding rush orders, it is true, one should be able to cope with them in an efficient manner and, in any event, a buyer has a right to expect shipment in twenty-four hours after receipt of order. To be assured of an adequate supply is essential, and a concern worthy of being in business should experience no difficulty in satisfying a buyer on that point.

The jobber has his rightful place in the modern structure of business and, as a rule, carries various lines of merchandise. A buyer would not expect him to have expert knowledge of a specialty, because if he did he would then be a specialist and his rightful sphere of activity would be the handling of such line exclusively.

SUMMARY

To sum up the matter:

Unless the buyer can place some reliance upon the integrity of the would-be seller, he should not attempt to have any business dealings with him at all.

Performance is the only real proof of the merit.

Performance in accordance with promise, or the right to return material to the seller without charge for the material used, is the usual guarantee afforded the buyer and should be a sufficient indication of the honesty of purpose on the part of the seller.

Because service enters into the cost—all statements to the contrary notwithstanding—the buyer should inquire into the quality of service rendered.

Proof that all cleansers are uniformly manufactured from standard ingredients secured from reputable producers can be easily determined.

Prices should be reasonable; but mere price per pound should not be the basis on which to pass judgment. The actual cost per unit of the cleaning effected and time required are equally important.

The capital of the seller is not of such extreme importance, provided the buyer can be assured of an adequate supply and at the same time be convinced that those with whom he is dealing are just as jealous of their credit rating and reputation as the firm that the buyer represents. This matter is easy to ascertain.

The above has been written with the idea in mind that the buyer is, because of his position, entitled to be informed fully upon the more vital aspects of the situation.

As for the so-called "fly-by-night" concerns, one can only say that time, which proves all things, will care for them in the ordinary course of events.

THE METAL INDUSTRY

With Which Are Incorporated
THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER
THE ELECTRO-PLATERS' REVIEW

Member of Audit Bureau of Circulations and The Associated Business Papers

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Contents

EDITORIAL

WAR ON WASTE

Waste is a big subject and the fact that everybody agrees that waste should be eliminated does not make it easier to do so. It is such a general term, and what some consider waste is by others considered necessary, since they live by supplying its replacements, that a program satisfactory to all and common to all industries is most difficult to draw up.

There is all the more reason therefore, to be grateful that we have in the Administration, Secretary Hoover, who seems to have a genius for finding a formula which will be helpful to all legitimate projects. Secretary Hoover's work in standardization, his institution and encouragement of the research into Waste in Industry carried on by the great technical societies, his program of Simplified Practice, and other projects too numerous to mention, have been the outstanding features of industrial history in the past five years.

One of the results of this movement was recently the first Industrial Round Table launched by the National Civic Federation to bring about, as far as possible, the elimination of industrial waste and the minimization of industrial strife. This round table was held in New York, April 11, 1925, and attended by Government officials, industrial corporation executives, railroad executives, labor leaders and others. The purpose of the meeting in simple terms, was to get together to find a common ground which would be beneficial to all the elements involved. One of these was immediately decided upon and that was the need for economy in processes and the lowering of the costs of production. It is noteworthy that this was agreed to, not only by executives, but by the labor men. It is needless to say that this marks a tremendous advance in the relations between employer and employee. It is so different from the conditions, for example, pointed out by Mr. Harper in his article on Early Polishing Machines, published elsewhere in this issue.

Further studies are in progress on the elimination of waste in distribution, which includes selling, advertising and transportation, sponsored by the Chamber of Commerce of the United States. The American Engineering Societies Commitee is also in back of the powerful movement to standardize manufactured products.

That this work is of interest not only to the United States, but is attracting attention abroad, is pointed out in our correspondence from Birmingham, England, in this issue. It is becoming more and more obvious that the way to industrial stability, peace, improved standards of living and general well-being lies to a considerable extent through lower costs of production and distribution, elimination of waste, and in general, making the things which human beings need, cheaply enough for them to be available in a larger measure.

WAR ON CORROSION

The metal industries have many problems, but if one were to pick the most important and the most troublesome difficulty, it would undoubtedly be Corrosion. Corrosion is not only the worst enemy of metals but it is the oldest. Its ravages are so widespread, its attacks come from so many different directions and result in such large losses that it is the enemy, not only of the metal trades, but of the metal using industries which cover almost everything in existence.

Industrial men, technical men and scientists have always been aware of corrosion and have always fought it, either by using the least corrosive metal under the conditions which it had to face, or by protecting the metal. The extraordinary expansion of American industry during the last ten years has, however, multiplied these problems many times. American manufacture has gone into so many new lines and each has presented so many new problems that it has finally become clear to everyone concerned that they must concentrate upon this question. As a result, literature has been compiled and published, researches have been instituted, technical societies have devoted entire meetings to it and committees have been appointed to concentrate on individual, specialized phases of corrosion. In other words, a defense army is being mobilized to protect us against corrosion. Practically every technical society of importance in the United States and abroad is at work.

THE METAL INDUSTRY has always featured progress of this sort. We have reviewed either in full or in abstract the papers read and bulletins and books published. Some of these papers have perhaps seemed a little theoretical, but in our minds it is clear that theory must precede practice before such a widespread and involved problem can be overcome, if it ever is overcome. In conformance with this policy, elsewhere in this issue will be found a report of the papers on corrosion, presented before the American Chemical Society in Baltimore, Md., April 6-11, 1925.

Corrosion will never be completely "solved" or eliminated. We cannot prevent nature's laws from operating. We can however, by adequate protection, by the use of proper alloys for resisting various chemicals and atmospheric conditions, by making certain parts easily replaceable, and by adjusting operating methods to the properties of the materials which have to be used, in other words, by combining our chemical, metallurgical and mechanical experience and ingenuity, reduce the cost imposed by corrosion and cut down wastage to a considerable extent.

This is the problem of industry and we believe that we are on the way toward achieving results.

THE CRUCIBLE SITUATION

There is no older or more honored or more reviled instrument of utility for human needs than the crucible. It was one of the first great advances in metal melting, for before its time metals were melted over a hole in the ground and had to be dug up and pounded into shape. The crucible enabled the worker to control the molten metal and to pour it directly into shapes which he desired. How many centuries the crucible has been used, nobody knows exactly, but we do know that in spite of its manifest limitations, in spite of the fact that it is one of man's oldest tools, it is with us today and as useful as ever.

At one time metal was melted for manufacturing purposes in crucibles only. Then came the open flame furnace which, at the time, threatened to "wipe it out." But the usual thing happened. The open flame furnace found its place and sphere of usefulness and the crucible retained its field. In the early issues of THE METAL INDUSTRY will be found reports of this struggle and the final results.

Then came the electric furnace and it also threatened to wipe out crucibles and incidentally open flame furnaces.

But it did neither. It simply found its place and left the others to keep theirs.

The answer is the usual answer to all equipment questions. There is no one universal and best method or tool. Every new development is an advance but it always has drawbacks. It is developed by minds which are only human and consequently it is never 100 per cent perfect. Today we have methods of transportation ranging into commercial flying machines, but we still on occasion find that the horse is the best means of conveyance, and more often than is generally supposed human feet will take us where nothing else can. The electric furnace is a wonderful instrument and eminently suitable under certain conditions; the open flame furnace has its legitimate field where it is unquestionably superior; the crucible has a place and a very large place still, from which it may never be dislodged. Every small brass founder knows what that place is and every caster who has to produce small to medium sized lots of special, high grade metal, will agree with him.

The Plumbago Crucible Association has entered upon an educational campaign to teach metal manufacturers when and how to use crucibles efficiently and economically. This program is strictly in line with the tendency of the times for each industry to speak for itself to the public and let that public judge.

ELECTRO-DEPOSITION RESEARCH

A short time ago, one of our contemporaries published an editorial to the effect that the Director of the Budget in Washington, had decided in the interests of economy to call for a "let up and, at least, a temporary stop in the research work planned by the Bureau of Standards in electro-deposition and electroforming." This was followed by a severe criticism of the Director for cutting down necessary expenditures and permitting unnecessary office-holders to return to their places.

In order to investigate at the source, we communicated with the Bureau of Standards asking for a statement, and received the following answer:

"There is no plan or expectation of postponing or dropping the research work at the Bureau upon electro-deposition. During the past year it has been necessary to somewhat reduce the force of the Bureau as a whole owing to the limited appropriations that were available and it is probable that the appropriations for the next fiscal year will be slightly less than those for the current year. While therefore the work on electro-deposition has been slightly decreased and may undergo slightly further decreases in common with most of the other branches of work at the Bureau, there is no reason to believe that it will be greatly curtailed, much less discontinued."

This is decidedly reassuring and although there will be slight decreases, it seems that they will not be of such a character as to cripple the work. Even though it is to our interest and the interest, we believe, of the whole manufacturing and consuming public to continue industrial research, we can all understand the need for rigid economy in the Government. We sympathize with the Director of the Budget in his problems and are glad to see that although research funds are slightly curtailed, the principle is respected and the work is encouraged.

All of which proves that it does not pay to lose one's head about a false alarm.

ART AND ELECTRO-CHEMISTRY

The electro-chemist has once more proved his value in unmistakable fashion, but this time in a non-commercial capacity. It seems that a number of ancient bronzes were sent to the electro-chemical laboratory at Columbia University and there treated by Dr. Fink for the purpose of discovering whether or not they were genuine antiques. The green coating or patina, which forms, in time, on all bronzes, is an easy matter to imitate. Of course, all these objects had it and the investigation proceeded along the lines of removing this patina and finding out the character of the base metal underneath. It was stated that some of the objects treated proved to be genuine antiques, but recently covered with the green coats by the dealer because the objects did not look old enough. On the other hand, a number of pieces treated showed when the green coat was removed, a clean casting in type metal, a perfectly good metal to use if that sort of thing is desired, but certainly not antique.

The work was said to have been carried on to the point of reducing the metallic oxides back into their original metallic state, and in some cases restoring badly imitated objects to their original duty. This was done by using a reverse current and setting up a reaction whereby the oxygen was eliminated and the oxides restored to their metallic state.

The Metropolitan Museum of Art of New York, for which most of this work was done, has now on the press an illustrated booklet showing the restoration of corroded bronzes and a description of the full details of the Fink method.

TECHNICAL PAPERS

The Furification of Copper Sulphate Solution, by G. S. Tilley and O. C. Ralston. Technical Paper 359, Bureau of Mines, Washington, D. C.

A paper describing previous work done and experiments performed by the authors, in the control and purification of the copper sulphate solution used in leaching copper ores. Iron and aluminum were the main impurities.

Design of Specimens for Short-Time "Fatigue" Tests, by L. B. Tuckerman and C. S. Aitchison. Technologic Paper No. 275. Bureau of Standards, Washington, D. C. Price 5 cents.

This paper discusses the controlling factors in the design of short-time "fatigue" test specimens,, which differ from those of the endurance-run type of "fatigue" test. In endurance runs it is necessary to secure failure at a place where the stresses are determinate and calculable. In Short-time "fatigue" tests failure is not desired.

It is possible, then, to design the shore-time "fatigue" specimen with maximum stresses uniform over a large portion of the material, thus securing greater sensibility. This should be the controlling factor in the design of these specimens.

Specimen shapes are shown suitable for different types of short-time "fatigue" tests. Because of the simple specimen shape the Sondericker type of machine is considered best suited for these tests.

GOVERNMENT PUBLICATIONS

Brass Lavatory and Sink Traps. Simplified Practice Recommendation No. 21, Bureau of Standards, Washington D. C.

Gold and Silver in 1923. By J. F. Dunlop, U. S. Geological Survey, Washington, D. C.

New Books

Metallurgy of Aluminum and Aluminum Alloys. By Robert J. Anderson. Published by H. C. Baird & Company, Inc. Size 6¼ x 9¼, 813 pages, 295 illustrations. Price, payable in advance, $10.00. For sale by The Metal Industry.

The developments in the use of aluminum and its alloys are considerably ahead of the literature on the subject and the present work of R. J. Anderson admirably brings up to date a sufficient literary treatment of the various branches of aluminum metallurgy. Whilst the phrase "Metallurgy" is used in the title of the book, it need not restrict the reader's viewpoint to the purely scientific side of the subject and while the reader will find a summary of the most recent research on the constitution of light alloys together with a number of excellent micro-photographs, the seeker after the practical viewpoint will find the information he wants set out in the most readable way throughout the volume.

In the introductory section dealing with the production of the metal, the author says, "Most interests which have contemplated aluminum production in recent years do not seem to understand that a combination of powerful financing, high technical skill, cheap and reliable electric power and adequate supplies of bauxite is necessary for success." In laying stress upon this matter the author no doubt has in mind several projects in which the above combination of successful elements was only partially provided. Hence the reason why so many apparently fruitful projects for the production of aluminum have fallen by the wayside, and hence, also, the reluctance of new corporations to enter this field.

The history of the aluminum business in this country has been closely linked with the various tariff acts passed from time to time, and in this connection the author, on page 26, falls into a slight error in describing the Underwood Tariff as the first of three codes under which protection was afforded to aluminum. Considering crude aluminum ingot, the duty was as follows:

Payne-Aldrich Act (1909)	7c per pound
Underwood-Simons Act (1913)	2c per pound
Fordney-McCumber Act (1922)	5c per pound

In other words, it would appear that aluminum has been somewhat a plaything of the political interests in the tariff field, for while in the early days it was properly protected by a high duty until its industrial status was assured, this was reduced under the Democratic administration without apparently injuring the business, but nevertheless the return of the Republican party brought the return of a higher tariff which was shared by aluminum.

The electrochemical operations resulting in the production of metallic aluminum are briefly treated by the author in Chapter 3. It would perhaps have been more instructive if a comparison had been made of the metallic elements showing in descending order their relative electro-chemical properties. Such a list would show in very marked fashion the difficulty with which aluminum is reduced from its oxide, as compared with, for instance, copper or tin. Owing to the extremely high heat of oxidation, per gram equivalent, of the molecule of aluminum, the yield per kilowatt hour is something like one-fifth to one-sixth that of more common metals and to a great extent the cost of producing the metal is dependent on this inherent physical characteristic.

On page 121 estimates are set out for the cost of production and in this statement the power consumption is fairly closely estimated. However, the conclusion derived from these estimates is that the plant can be operated at normal capacity for twenty-four hours per day every day in the year and that every pound of aluminum so produced can be sold without incurring charges for storage. Actually, the facts are quite otherwise. In the first place, it is unfortunately very rare to find water power plants which can be operated continuously through winter and summer at a load factor of unity. Ice conditions in the North and low water in the South usually lead to a dry period of longer or shorter duration when the plant must be partly or completely shut down. During this period, of course, interest on the investment has to be met even though there is no production to pay it, and these charges must naturally be assessed against the productive periods. On the other hand, when everything is favorable on the production side, the market conditions may be poor and it is necessary to steer a straight course between the Scylla of over-production and the Charybdis of a metal famine. Obviously, therefore, the ideal conditions on which minimum cost of production is based are met only for a short period in each year.

In treating of the aluminum cooking utensil trade, the author says, on page 322, "Practically no light aluminum alloys are used for pans, roasters or similar utensils." It might be remarked that the 3-S alloy, which contains one to one-and-one-half per cent manganese, is apparently still in use for a great proportion of these products, it being generally more resistant to corrosion, warping, scraping and other ill usage.

As might be expected, the chapter on "Preparation of Aluminum Alloys" is very complete and easily understood. It might be pertinent to ask whether aluminum-copper alloys ought always to be awarded first place. No doubt the tonnage of these alloys in production will continue to increase, but in respect of high quality castings and easier foundry practice, alloys which incorporate no copper appear much more promising at the present stage of progress. Moreover, where castings will be exposed to weather or other corrosive influences, copper ought never to be a constituent. In any event, the reader will be very interested to find information on preparing aluminum alloys containing nickel, manganese, iron and other elements which have often been a source of annoyance in the foundry because of the difficulty with which they are dissolved in aluminum. Needless to say, the aluminum-silicon group of alloys is fully treated in the book under several headings.

Extrusion as a method of fabricating aluminum is attaining increased use, both as a preliminary to cold drawing and as a means of producing finished sections. Tubes are generally finished by cold drawing because the smallest gauge which can be extruded is somewhat heavy and the product is not generally of sufficient hardness. Rods and shapes for automobile molding and other purposes are, however, produced direct in the extrusion press and in nearly all cases are entirely free from the lamination defect to which the author refers. This is generally confined to sections where the reduction in area from the billet to the rod is relatively small, whereas the ideal use of the extrusion process is for a very considerable reduction, in which case it might be supposed that the material received the equivalent of a greater amount of work.

In conclusion, it might be supposed that a work of this kind would be open to criticism on account of its omissions. However, in actual fact, the author, in a volume of 882 pages has treated in a very thorough fashion the manifold aspects of metallic aluminum, its production and use. The most valuable adjunct to the book, however, consists in the very complete sources of bibliographies, one of which forms an appendix to each chapter. The reader who wants to make his study more complete has therefore only to turn to the bibliography to find reference to virtually every authoritative statement on the subject.

E. V. Pannell.

Platinum Metals. By E. A. Smith. Published by Isaac Pitman & Sons, New York. Size 5 x 7, 123 pages. Price, payable in advance $1.00. For sale by The Metal Industry.

Another of the series on common Commodities in Industries, others of which have been reviewed in these colums. It is a small work, evidently meant primarily for general information rather than practical purposes. Nevertheless, it contains a great deal of information of real value to the practical worker in platinum, whether he is engaged in mining or jewelry manufacture.

The book deals with the following topics: History of Platinum Metals; Occurrence; Distribution; Sources; World's Production; Mining; Metallurgy; Physical and Chemical Properties and Industrial Uses.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

BLACK ON ALUMINUM

Q.—How can I get an oxidized black on aluminum?

A.—The production of black colors on aluminum is somewhat difficult. Aluminum is a non-oxidizable metal. We suggest that you try the following formula: Water, 1 gallon; muriatic acid, 1 gallon; powdered white arsenic, 10 ozs.; sulphate of iron, 10 ozs.

The arsenic should be dissolved in the muriatic acid first. It is advisable to heat the acid to aid the arsenic to dissolve. The iron sulphate should be dissolved in half the water heated to 120° F. Use the solution cold. The aluminum surface should be carefully cleansed before immersion in the coloring dip. Finally lacquer the surface to protect it.

Patent No. 1,095,357 was granted May 15, 1904, for coloring aluminum with various colors.—C. H. P., Problem 3,350.

BLISTERED NICKEL

Q.—We would appreciate very much if you could give us some information regarding our new nickel solution which we have built up as follows: Single nickel salts, 16 ozs. to a gallon; boracic acid, 2 ozs. to a gallon; sal-ammoniac, 2 ozs. to a gallon.

We have put in the full amount of sal-ammoniac according to the above formula but still lack 1-3 of an oz. to a gallon of boracic acid. But in addition have added 2½ ozs. of single nickel salts, making a total of 18½ ozs. of nickel salts per gallon. The hydrometer stands at 10 and should stand about 7 or 8. Our trouble seems to be too much acid probably due to the excess of single nickel salts.

The work appears to be rough and pitted when removed from the solution and also the work blisters occasionally in spots. The nickel seems very brittle. The red litmus paper stays red but the blue turns red immediately.

A.—You can improve your formula by adding 2 ozs. Epsom salts. The boracic acid is ample. For a normal temperature solution 16 ozs. single salts would have been ample. Blue litmus paper is the litmus test for acids. Add 26° F. water ammonia on the basis of 4 fluid ozs. per 100 gallons of solution to neutralize the free acid. Repeat only if found necessary and then only 1 oz. at a time.

The blue litmus paper should turn only a violet tint. The addition of 1 to 5 grains of cadium chloride per gallon of solution will give you a much betted nickel deposit. The above amount means ¼ oz. minimum per 100 gallons of solution, and 1 oz. maximum. Try these additions first in a 10 or 20 gallon test solution, using your present solution as it now stands, as the basis.—C. H. P., Problem 3,351.

CASTING GOLD ALLOYS

Q.—Both the manufacturing jeweler and the dentist have occasion to melt and cast alloys of gold, platinum, silver and copper, with varying percentages of these metals. We have been preparing these alloys in gas fired crucible furnaces. The jeweler or dentist who uses them melts them with a gas and air blow pipe. We have had so many complaints to the effect that castings made from our alloys when polished show minute pin holes or a more or less general porosity. For example in casting a ring or other object there will be spots in the casting that show a collection of gases. I have never been able to know definitely whether this seeming gas absorption is due to the copper, the silver or the melting flame, or is it due to the way the alloy is prepared?

I have heard that sometimes cadmium is used in sterling silver to prevent oxidation of the copper and also to prevent gas absorption in the melt. I have also heard of the use of zinc, aluminum phosphorus, etc., for this purpose in melting copper.

A.—It would seem from the statement of your troubles that you may have to blame several sources for contributing to your poor results. In the first place, do you start with highest grade metals? Or are you endeavoring to use a large percentage of miscellaneous jewelry scrap? If you are working with high platinum content alloys, the blow pipe method is no doubt your best guess, but see that emptying of crucible is done with a minimum of disturbance to the melt. A tilting crucible with mold near by or a crucible or bed with hole in bottom that can be readily opened up to let molten content flow into the mold beneath will be helpful. In melting and alloying gold and silver with copper, a crucible furnace, gas-fired, should meet all requirements. Gases absorbed or oxides are probably causing the porosity of which you complain. Cover your melts with ample charcoal. Don't overheat, and pour as slowly as size of mold will allow. If pouring in closed upright molds, you will get better surfaces, and heads should shrink, not puff up. If very particular work is required on platinum or any of the other metals, it may be necessary to machine the surface of the bar before rolling. If a metallic deoxidizer is to be used on your silver copper alloys, I would not recommend cadmium. I have noted that its use is common in Sterling silver melting, but my experience suggests other elements. I think that you will contribute to the soundness of your silver copper castings if you use 1-10 per cent silicon copper, stirring it into the metal well just prior to pouring. You will also make for more soundness in your silver copper castings, if you use a low phosphor-copper, introduced say as a half of one per cent alloy to the extent of 10 per cent of your copper content.—H. D. C., Problem 3,352.

CLEANING RADIATOR SHELLS

Q.—We are getting ready to plate radiator shells on a production basis and wish to plate a nickel strike directly on the steel followed by duplex copper. We have used this method very successfully except for the fact that in order to secure a good nickel strike on all parts of the shell we have had to take extreme care in cleaning the shell which slows up production. Our experience has been that cleaning compounds which successfully remove the polishing grease does not entirely remove the machine oil which is on the inside of the shell. Do you think that we are expecting too much of a cleaner to try to remove both kinds of dirt with the same cleaner and at the same time?

A.—You must realize that a chemically clean surface is absolutely necessary to produce the maximum efficiency in adherence of the plated deposit from any type of solution. To remove excessive grease and presumably oil of the insoluable type, it is necessary to use an unusually strong cleaner, or to use two cleaners. The first is to be made up of 4 to 8 ozs. caustic potash and 2 to 4 ozs. of soda ash per gallon of water and operated at 200° F. The second cleaner should be of any ordinary type of commercial cleaner to which may be added ⅛ oz. yellow rosin and ¼ oz. sodium cyanide per gallon of cleaning solution. The point is first to remove as nearly as possible all the insoluble oils and greases and to use the second cleaner as the finishing cleaning solution. Always remember that an ounce of good cleaning may save a pound of future trouble in plating operations.—C. H. P., Problem 3,353.

COARSE GRAINED BRONZE

Q.—I am enclosing two pieces of metal made from 80 copper, 10 tin, 10 lead, with 15 per cent phospher copper for flux. The long piece is cut from a bushing weighing about 10 lbs., and the short one from a casting weighing about 50 lbs.

You will note the long piece has a much finer grain than the

short one. I would be glad to have your advice as to what causes the difference in the grain. Can you get the same grain in a large casting as you can in a small one made from the same mixture?

A.—On examination of the sample submitted under the glass we find very little difference in the grain. However, we find in the small piece segregation which may be caused in melting of the metal. Neither of these samples show a very fine grain for 80-10-10 mixture. We would suggest, if these samples are made from new metal, that more care be taken in adding the lead and tin. However, even under the best conditions a thinner section will show a finer grain as compared with the heavy, due to the slow cooling; but in either case it should be better than the samples submitted.

The ideal way in adding the tin and lead is to run the tin and lead down in ingots 50 per cent each, add to the copper a little at a time and stir well after each lot of mixture added. —W. J. R., Problem 3,354.

ELIMINATING ROUGE

Q.—Would you kindly let me know the composition of your green platinum rouge? I have been refining my polishing sweeps and the green rouge seems hard to get rid of. Probably you could tell me what flux to use or what acid would clean it out of my polishings?

A.—The factor with which you have to contend from the sweeps containing the green platinum rouge, is chromium oxide. This material is insoluable in water and acids. It is possible that it could be reduced with aluminum filings as used in the reduction of the oxide to the metallic state by the Goldschmidt process. Otherwise, we have no further data covering its elimination.—C. H. P., Problem 3,355.

LEAKY BASIN COCKS

Q.—I have made composition brass basin cocks for months with not over 5 per cent leakers and usually down to 3 per cent. All at once they float up to 50 per cent. The castings machine nicely; no spongyness, and free from dirt; also polish beautifully, so I can't see where the gating is at fault.

On analysis the ingot showed 3 per cent antimony, which with 4.10 per cent tin would harden it. Now my claim is that antimony is the chief cause. Tell me what you think?

A.—For proof that antimony will cause castings to leak under pressure, we suggest reading an article by S. D. Sleeth, in The Metal Industry of December, 1916, page 505. In this article Mr. Sleeth states that great care must be taken to see that no aluminum gets into the mixture, as a very small percentage of it will cause the castings to leak. Antimony and iron will do the same, but not to so great an extent. Antimony does not act as quickly as aluminum, but has about the same effect, if used enough in the mixture. You may start out with a small percentage and it seem to do no harm, but if used until it is mixed with all returned material, such as turnings, gates, etc., the castings will become porous.

This we think is proof that antimony in the metal will cause defects such as you speak of. However, we think changing the gate to the cope side is the proper method of gating.—W. J. R., Problem 3,356.

MERCURY IN CYANIDE STRIP

Q.—How can mercury be made to stay in a cyanide solution used for stripping white gold?

A.—Mercury salts or its compounds are soluble in sodium cyanide solutions and evidently must be carried out with your product that is cleansed by electro stripping. Have you ever tried putting a small amount of metallic mercury in the botton of your electro-stripping solution? Be careful that the white gold product you strip does not come directly in contact with the mercury. You might try this method because the metallic mercury is only sparingly soluable in cyanides. Therefore, will remain more constantly in solution than its salts. The following formula is used in Providence and the Attleboros for stripping white gold: Water, 1 gallon; sodium cyanide, 12 ozs.; bicarbonate of potash, 6 ozs.; acetate of copper, 4 ozs.; carbonate of potash, 2 ozs.; phosphoric acid 50 per cent, ½ to 1 oz. Strip under usual conditions; hot solution, reversed current.—C. H. P., Problem 3,357.

NICKEL MERCURY SOLUTION

Q.—I have a formula for putting a nickel finish on metal and don't know what kind of nickel metal is required. The formula follows: 1 ounce nickel metal; ½ ounce mercury; 1 ounce nitric acid. Place in glass; the acid will eat the metal up. Then add 1 qt. water.

Would you advise this for putting a thin coating of nickel on steel to prevent rusting?

A.—The only metal you would precipitate on the steel from such a solution would be metallic mercury. Such a deposit would not be rust proof, and we believe might not even result from such a solution.

You might write to one of the nickel producers. Ask them to send you about 2 ozs. of the thinnest sheet nickel they produce. You can reduce the metal in the nitric acid, then reduce the mercury. The result will be a solution of nitrate of nickel and mercury. Add the water as your formula calls for. We shall be interested to learn the results you obtain. You may have to add ½ to 1 oz. of water to the nitric acid to start its reducing action.—C. H. P., Problem 3,358.

SATIN SILVER FINISH

Q.—How can I produce a satin silver finish on auto parts?

A.—You do not mention the name of the base metal on which you desire to produce a satin silver finish. Is it brass or steel? A satin finish on brass can be produced by acid dips or by the acid of a sand blast. Steel would have to be sand blasted as a basis for the satin finish.

You can, however, purchase from platers' supply houses a steel satin finishing scratch brush that would answer your purpose. If this data does not cover your question, give us a little more information as to what you actually desire to accomplish. After you have produced a basis satin finish on your articles, the satin silver finish can easily be produced.—C. H. P., Problem 3,359.

TIN SWEAT

Q.—We are having some trouble with our metal and would like to have your opinion about it. Our castings are mostly for architectural work. We just had some big doors in which we had some white spots, lead sweats. We are using mostly sheet bronze scrap and in order to make it run better in sand molds, we add to every hundred pounds of scrap 4 lbs. of tin and 3 lbs. of lead. With this metal we come out all right, for most of our work, except for some porous holes, when we pour too hot, and occasionally some lead sweat.

A.—There are two kinds of commercial sheet bronze, one containing 90 copper and 10 zinc, and the other 95½ copper, 4½ tin, with about .25 phosphorus. We would judge the grade you are using contains 4½ tin, so the material sweating out is tin. We advise you to use a deoxidizer to overcome the tin sweat, and suggest ¼ per cent carbon-free 30 per cent manganese copper.—W. J. R., Problem 3,360.

VERDE GREEN

Q.—We have been trying for several months to obtain a formula for giving bronze work a verdigris finish such as develops on copper when used for outside work.

A.—On page No. 21 and 22 of Platers' Wrinkles will be found several formulæ for verde greens, including the well known Tiffany green verde finish. As noted in these formulæ the articles should be copper plated and lightly oxidized with polysulphide solution first before applying the verde green solutions.

For light green verde finishes the solutions given may be applied direct to bronze or brass surfaces.

Sometimes it is necessary to apply more than one coat. A soft painter's sash brush should be used to give a variegated finish by stippling when the green surface is partly dry.—C. H. P., Problem 3,361.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,527,576. February 24, 1925. **Process of Coating Conducting Materials With Tin.** Isaac M. Scott and Samuel Peacock, Wheeling, W. Va., and William Earl Armstrong, Martins Ferry, Ohio, assignors to Wheeling Steel & Iron Company, Wheeling, W. Va.

The process of coating tin on electric conductors which consists in providing an electrolytic solution containing tin dissolved in boro-fluohydric acid; immersing the article to be coated in said solution; and passing a current of electricity from said solution to said article to obtain the desired coating.

1,527,577. February 24, 1925. **Electroplating Bath.** Isaac M. Scott and Samuel Peacock, Wheeling, W. Va., and William Earl Armstrong, Martins Ferry, Ohio, assignors to Wheeling Steel & Iron Company, Wheeling, W. Va.

The herein described electroplating bath for depositing tin on electric conductors the same consisting essentially of a solution of stannous fluoborate.

1,527,734. February 24, 1925. **Apparatus and Method for Electrolytically Depositing Metals.** Nathaniel Huggins, New York, N. Y., assignor to The Electrolytic Corporation, a Corporation of Delaware.

The method of electro-deposition which consists in subjecting a solution simultaneously to the action of a direct current and also to the action of a uni-directional, pulsating current.

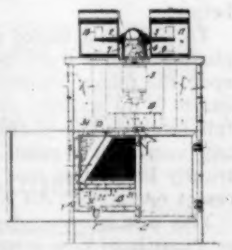
1,527,743. February 24, 1925. **Bearing Brass.** Harold G. Martin, Philadelphia, Pa., and Michael H. Newgirg, Baltimore, Md. Filed Nov. 14, 1921. Serial No. 515,074. 2 claims. (Cl. 64—10.)

A bearing brass having a reinforce, of maximum thickness and imperforate throughout the central portion of the brass, said reinforce formed wholly beyond such central portion with openings to receive the brass material in casting to thereby form an interlock between said material and reinforce.

1,527,942. February 24, 1925. **Recovery of Silver From Solutions Used in Photographic Work and Regeneration of Such Solutions for Further Use.** Louis Weisberg, New York, N. Y.

The process of recovering silver from solutions used in photographic work and regenerating such solutions for further use, which comprises subjecting the silver to the action of ferrous hydroxide in the presence of alkali.

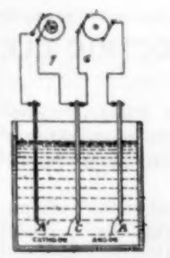
1,528,439. March 3, 1925. **Dust Collector for Polishing Machines.** Gustave A. Leiman, New York, N. Y., assignor to Leiman Bros., New York, N. Y., a copartnership composed of William H. Leiman, George W. Leiman, Gustave A. Leiman, Edward C. Leiman, and John Leiman.



A dust collector for polishing machines comprising a plurality of inlet compartments, an outlet compartment interposed between said inlet compartments, a settling compartment common to the inlet and outlet compartments, a screen removably secured in the outlet compartment, and a fan located in close proximity to the outlet compartment for exhausing the air from the compartments.

1,529,083. March 10, 1925. **Process of Coating Iron and Steel Shapes With Other Metals.** Samuel Peacock, Wheeling, W. Va., assignor to Wheeling Steel & Iron Company, Wheeling, W. Va.

The process of coating iron and steel shapes with other metals which consists in covering the surfaces to be protected when in an oxidized condition with a porous and relatively non-adherent deposit of the coating metal from a solution; and by the aid of heat converting said deposit into a partially oxidized non-porous and adherent protecting film on said surfaces, substantially as described.



1,529,249. March 10, 1925. **Method of and Apparatus for Electrodeposition and the Product Thereof.** Harry D. Gue, Brooklyn, N. Y.

The herein described method of electrodeposition consisting of employing an electrolytic apparatus substantially as described and also employing in addition thereto an electrode immersed in the electrolyte and bringing said additional electrode and one of the usual pair of electrodes into a common electric circuit of predetermined characteristic.

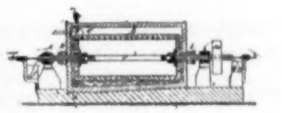
1,529,277. March 10, 1925. **Heat-Resisting Alloy.** Otto C. Rohde, Toledo, Ohio, assignor to Champion Spark Plug Company, Toledo, Ohio, a Corporation of Delaware.

An engine ignition electrode consisting of a metal alloy, comprising nickel-cobalt metal, small amounts of manganese and a small amount of a metal catalyst for pre-heating the alloy when in the presence of carbonaceous material, the nickel-cobalt metal predominating in quantity.

1,529,747. March 17, 1925. **Electroplating Apparatus.** Elmer J. Mercil, Oak Park, Ill.

In an electroplating apparatus, the combination with a tank containing an electrolyte; an anode element in said electrolyte; a barrel within the tank and in communication with its interior to receive electrolyte therefrom; a cathode element carried by said barrel and in contact with the electrolyte therein; a metallic bearing structure within the tank and upon which the barrel is mounted to turn, this bearing structure to be movable to permit the barrel to be placed in accessible position.

1,530,154. March 17, 1925. **Apparatus for the Condensation of Volatile Metals Such as Zinc and the Like.** Fritz Caspari, Gelsenkirchen, Germany.



Apparatus for condensing zinc vapours, comprising a stationary chamber, a drum or cylinder mounted in said chamber, means for imparting rotary motion to said drum, a heating means attached to the inner wall of said chamber, means for supplying the chamber or casing with zinc vapours, means for drawing off from the chamber the residue or waste gases, and a means for periodically tapping the chamber or casing for liquefied zinc, substantially as and for the purpose set forth.

1,530,374. March 17, 1925. **Metal Coating.** Floyd C. Kelley, Schenectady, N. Y., assignor to General Electric Company, a corporation of New York.

An article of manufacture comprising cast iron, a coating of cupreous metal united with the cast iron, the surface of the iron at the junction with said cupreous coating containing less carbon than the main body of said iron, and a layer of Babbitt metal united with said cupreous metal.

1,531,417. March 31, 1925. **Plating Apparatus.** Louis Schulte, Chicago, Ill.

In a device of the character described, a stationary electrolyte tank and a hollow anode rotatable in said electrolyte.

1,531,445. March 31, 1925. **Making Metal Castings.** Simon Lake, Milford, Conn.

In an apparatus for making metal castings, a flask, a mold within said flask, a frame adapted to surround said flask and provided with sealing means adapted to be compressed to form a seal around said mold, means for creating a vacuum within said mold, and means embedded in said mold for heating it.

1,532,112. March 31, 1925. **Electroplating Apparatus.** Charles E. Jones, Schenectady, N. Y., assignor to General Electric Company, a corporation of New York.

An electroplating apparatus comprising a tank consisting in part at least of metal, a cathode projecting through the bottom of said tank and being electrically insulated therefrom, and a non-conductive container for work to be plated surrounding said cathode.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

ELECTRIC CLEANING SYSTEM

This system developed by the Jantz & Leist Electric Company of Cincinnati, Ohio, can be made to fit the requirements of plants of various sizes. The description here given refers to a typical installation.

A 5,000 ampere Jantz & Leist generator, adjustable from 8 to 12 volts. This motor-generator produces the current which is transmitted through a multiple of 1¼ inch copper bars, leading to the tank that contains the solution, consisting of a compound that will remove paint or varnishes of any description from metal. In one case they were buckets, open at one end, and 12 inch diameter x 13 inches high. A clamp carrying the negative pole is fastened to the bottom of the bucket; a suitable positive pole of insulated cage type, covering the inside and outside walls of the container, allowing about 2½ inch space between the metal container and the anode, as it were, and this is placed in the cleaning solution. The current is switched on, taking about 1,000 amperes at 12 volts. This is left on between 2 and 3 minutes, and then the switch is opened, the containers unclamped from negative pole, coming out clean metal.

The action of the current is to form a gas under the paint, lifting it from the metal and letting it float in the solution. The solution does not mix to any extent with the removed paint so that after a run of a day or two, the removed paint can be taken out of the tank, leaving the solution ready for more cleaning. The solution is used at a temperature between 160 and 180 degrees F. There are no poisonous vapors coming from the solution and the men are able to handle this work without danger. There are a number of containers cleaned at one time; in fact, the process is continuous. After the first bucket is put into the tank, the second, third and fourth one is placed, then the first one is ready to come out, and another bucket can be put in its place so that the process for one or two men can be a continuous cleaning service.

Regarding the cost of operation, insofar as the current goes, there are used 12 k. w. for three minutes at an average cost of practically two cents per kilowatt hour. This would be practically 20 buckets per hour at a cost of .012c for the current. The solution cost is said to be low, and the labor should be added to this. Buckets are returned in the shape of chemically clean iron, getting a thorough cleaning in all the crevices that it is impossible to clean any other way, and it is claimed that this is the quickest and best way to do this class of work. Two men can handle this size of electro-cleaning process, where it formerly required six men to do the same amount of work by hand scrubbing.

This process uses no solvent that might be inflammable.

The following industries can use this method of electro-cleaning:

Milk distributors—for cleaning their metal milk containers.

All kinds of paint and varnish manufacturers.

Hotels—for cleaning their table silver and hollow ware.

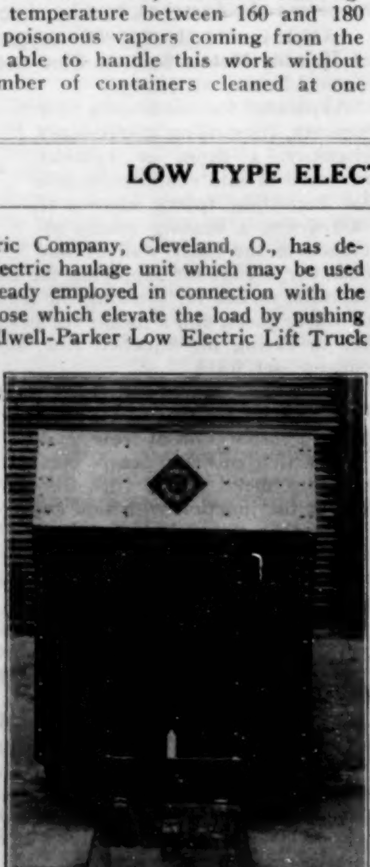
Sheet metal and stove manufacturers—for electro-cleaning sheet metal before japanning, painting, spraying or otherwise finishing.

Metal cabinet manufacturers—cleaning metal cabinets electrolytically before japanning, painting or spraying.

Automobile lamp housing manufacturers.

LOW TYPE ELECTRIC LIFT TRUCK

The Elwell-Parker Electric Company, Cleveland, O., has developed and now offers an electric haulage unit which may be used with the same platforms already employed in connection with the hand lift type truck, i. e., those which elevate the load by pushing down on the handle. The Elwell-Parker Low Electric Lift Truck consists of a hot riveted steel frame, equipped with an electric motor driving 22"x3½" rubber tired wheels through a worm reduction running in oil. The frame is suspended on springs over this drive axle. A compartment located immediately over the drive axle houses an electric storage battery of either the alkaline or lead type. This battery is of sufficient capacity to operate the truck all day long.



ELWELL-PARKER LOW ELECTRIC LIFT TRUCK

The motor will drive the truck with a load up a 10% incline, which was a haulage impossibility for the hand lift truck. The axle beneath the truck platform is equipped with 5¾"x4" wheels and the top of movable platform of the truck built of ¼" steel plate, 18" wide and 46" long, clears the floor 6¼" when in its lowered position. When fully elevated it clears the floor 9¾", i. e. 3½" lift.

The load is lifted by means of an arm or screw ram attached to the rear of this rocking platform between two of the supporting links. The other end of the ram is drawn into a threaded nut which is in fact the hub of a bronze worm wheel, which in turn is driven by a steel worm directly splined onto the armature shaft of a second motor which receives power from the battery mentioned before.

To pick up a loaded skid, the operator drives the narrow truck platform of his truck beneath it, closes an electric switch, whereupon the motor actuates the mechanism which lifts the load 3½ inches in 10 seconds, stopping automatically when it has reached full height. The platform may however be stopped manually at any intermediate point. Load is driven to destination and electrically lowered at spot where wanted and the truck is free for a repeat operation. All four wheels on this truck are steerable.

This unit is intended primarily to extend the hand lift system—as a matter of fact, it may be used to carry a load and at the same time trail a load on a hand lift truck. Moreover it will carry a 4,000 pound load at the speed of 300 to 400 feet per minute, a saving ratio over the hand truck without the fatigue of hand over machine tools being considered, of 24 to 1.

SUPER-TINNED COPPER SHEETS

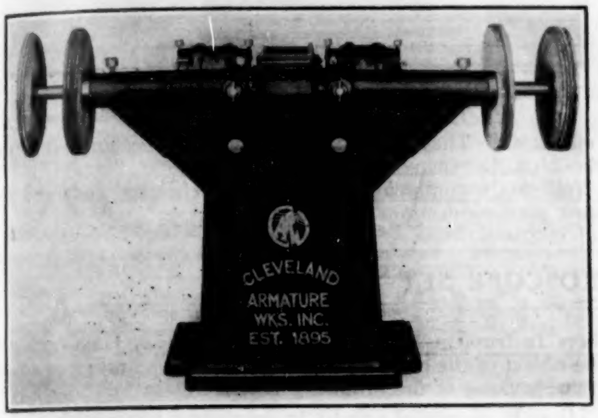
The Detroit Copper & Brass Rolling Mills, Detroit, Mich., have placed on the market "Super-Tinned" copper sheets. The coating of tin on these steets is said to be from three to five times as thick as those on regular commercial tinned sheet. They are being produced by a new process, and it is stated, will outlive the regular tinned sheets by many years, under the severest uses, so far as the tinning is concerned.

NEW BUFFING AND POLISHING MACHINES

The Cleveland Armature Works of Cleveland, Ohio, have recently put on the market an extra heavy duty double spindle and a heavy duty single spindle buffing and polishing machine, both of which are chain driven from motors, close to the spindles and on which any desired spindle speeds can be obtained with alternating current motors, 60 or 25 cycles.

This is a radical departure from all previous equipment which uses flat belts to obtain desired speed change, these short high speed belts having a high power loss, and being very short lived and expensive to maintain.

The double spindle extra heavy duty buffer and polisher consists of one casting, forming motor base, central chain box



DOUBLE ENDED CHAIN DRIVEN BUFFER AND POLISHER

and spindle housings. Special motors with flanged end bells are bolted to each side of chain box, their shafts projecting into box through slotted openings so motors can be moved back to take up chain slack,

Spindles are mounted in tubes which are part of main casting, with their ends also projecting into chain box. Drive is by steel silent chain running on hardened steel sprockets. Chain box is tightly closed and holds two gallons of heavy oil into which oil slingers on motor shafts dip and keep chains and sprockets constantly bathed in oil. Oil level is checked by petcocks on rear and drain is provided for cleaning.

Shafts are chrome nickel steel, all eight bearings are Timken tapered adjustable roller, requiring adjustments only at long intervals and which can be made from outside without disturbing set up.

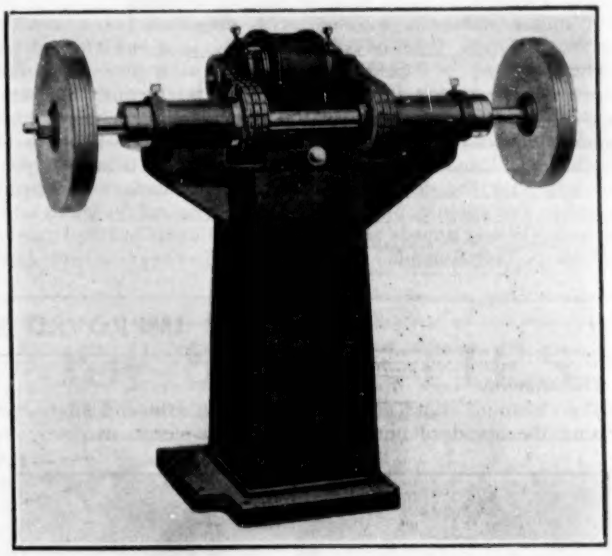
Each spindle is provided with shaft lock to hold it rigidly while changing wheels.

Right and left halves of machine are entirely independent mechanically and electrically, can start and stop independently and run at different speeds. There is no power loss when one man only is working. Each motor is controlled by oil circuit breaker operated by button in front of operator and provided with time limit overload protection. Motors are guaranteed for 25 per cent continuous or 100 per cent momentary overload.

Bearing lubrication is by light grease in cups requiring one turn per week. Transmission efficiency including chain and bearing friction is guaranteed 98 per cent.

Standard spindle speeds on 60 cycles are 2300, 2600, 2900 and 3100 r.p.m., on 25 cycles, 2300, 2600, 2800 and 3100 r.p.m., any special speed can be made to order.

Machines are made in four standard sizes of overall spindle



HEAVY DUTY, SINGLE MOTION, CHAIN DRIVEN BUFFER

lengths, 48", 58", 60" and 70". Weights are 1500 to 2000 pounds. Motors are designed for this particular service and are manufactured complete by Cleveland Armature Works, Inc. They are made 2 to 6 H.P. each or 4 to 12 H.P. total on machine and of any phase, voltage or cycles.

The heavy duty buffer and polisher has a single spindle and single motor which drives by multiple chains (one per H.P.) leather faced and running in deep V grooves on pulleys. Enclosing housing has been removed in cut to show construction. Motor has adjustment to take up chain slack.

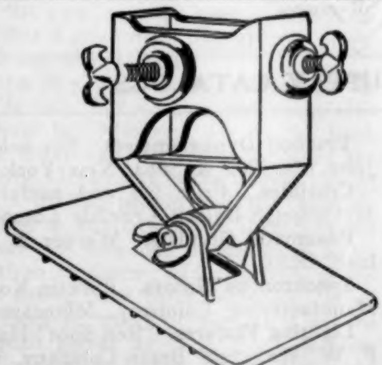
Standard spindle speeds are 2200, 2500, 2800 r.p.m. on 25 or 60 cycles.

Bearings are Timken tapered adjustable with light grease lubrication. V chain requires no lubrication and transmission efficiency is 96 per cent.

This is made in two frame sizes with overall spindle lengths of 48" and 60", and in 2, 4, 6 and 7½ H.P., 60 or 25 cycles, weights from 1200 to 1500 pounds.

SAFETY SHOES FOR LADDERS

The U. S. Safety Appliance Corporation, 663 Erie Building, Cleveland, Ohio, is placing on the market a new safety shoe to prevent ladders from slipping. They are made of cast iron, single in design, having very few parts, and take a firm grip on the floor or ground. The flexible joint permits their use, it is claimed, on uneven soft ground, ice-covered surfaces, indoors or out.



SAFETY SHOE FOR LADDERS

WOOD GRAINS ON METAL

A mechanical device for producing wood grains on metal in Porcelain Enamel has been put on the market by The Ferro Enamel Supply Company, Cleveland, Ohio.

This is known as the Oxvar process, and it is claimed successfully reproduces oak, walnut, mahogany, circassian, leather grains, marble, etc.

This opens up a wide new field for the use of porcelain on sheet steel and cast iron.

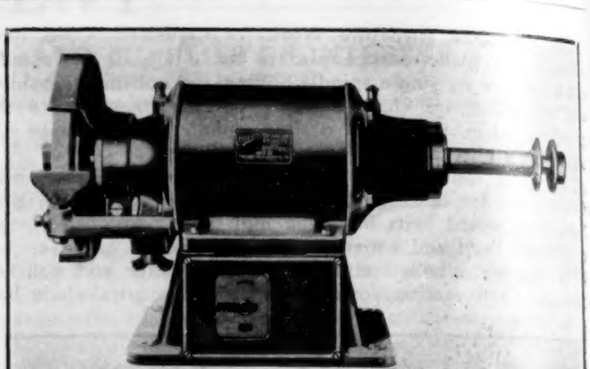
50-50 ARSENICAL COPPER

An arsenical copper, 50-50 in proportions is being marketed by de Courcy Browne, Inc., 8 W. 40th Street, New York. This material is recommended as a molten metal cleaner as well as for holding up a high lead content in an alloy.

COMBINATION GRINDERS AND BUFFERS

The Hisey-Wolf Machine Company, of Cincinnati, Ohio, has added new combination grinders and buffers to its line. There is the bench type and also the floor stand type. They are made in ½ and 1 H.P. sizes with open and encased spindle extensions, and adapted for a large variety of work requiring the use of a grinding wheel, buff wheel, wire brush wheel or rotary wire rasp wheel. High-grade ball bearings are used throughout. Combination grinders and buffers with encased spindle are fitted with four bearings. Open spindle machines require only two bearings. All bearings are completely enclosed from dust and grit and provided with heavy felt protector washers on each side of bearing housing.

A motor starter is supplied with these machines, superior to the ordinary type of switch. This is a most important feature, worthy of careful consideration, as it gives maximum protection to motor from overload when starting and while running. Spindles are unusually heavy, being made of high-grade steel and accurately ground. The flange washers are machined all over and correspond to other balanced parts entering into the construction. All inner flanges are firmly keyed to the spindle, but can easily be removed by hand when desired. Wheel guards are of standard dimensions and specifications as recommended by American Engineering Standards Committee. They are adjustable, and so designed that the wheels can be removed independently.

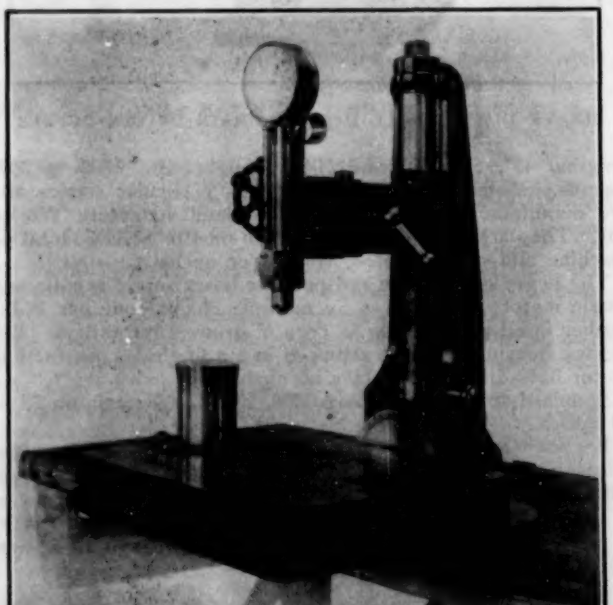


BENCH TYPE GRINDER AND BUFFER

Full safety combination guards with enclosed ends and exhaust pipe connections can be supplied.

IMPROVED SCLEROSCOPE SET

The machine here illustrated is a nonportable combination of the clamping stand and separate swing arm and post, comprising the standard portable Scleroscope outfit, made by the Shore Instrument & Manufacturing Company, Jamaica, N. Y. The object of the combination is to enhance its range of adaptability because of the following new features:



IMPROVED SHORE SCLEROSCOPE

1. Greatly increased size to accommodate large work.
2. Has graduated heavy tilting table which can be set at any angle.
3. Has large removable center anvil for specimens that extend through.
4. Has ball bearing swing arm rigid enough to permit clamping down of specimens.
5. Swing arm can be set in any lateral or vertical position with elastic return to lateral setting.
6. Eliminates necessity for most special holding fixtures otherwise required for mass production testing of odd shaped pieces.

The Scleroscope fitted on to this machine is the same as used in the portable set, with which its dove-tail bar is interchangeable. This feature is said to enable the user to make the best possible selection of an equipment to meet his special requirements.

NEW STAMPING METAL

The New England Brass Company is placing on the market a metal called "White Brass," for jewelers, novelty and silverware manufacturers, for deep drawing, stamping and spinning purposes.

It is about the color of ordinary brass but is said to have a much closer grain and to stamp and draw much more deeply and smoothly, with less annealing and also takes a brighter finish than the regular brass. The metal is manufactured up to 8" wide in all gauges.

EQUIPMENT AND SUPPLY CATALOGS

Nickel Zinc. A file card from the Apollo Metal Works, La Salle, Ill., with a table of gauges and weights of sheet metal.

Leather Meal. For polishing small articles in tumbling barrels. Hanson & Van Winkle Company, Newark, N. J.

Metal Cleaners. A folder on Meco cleaners from the Meaker Galvanizing Company, Chicago, Ill.

Engineering Foundation. Report for the year ended February 11, 1925. Headquarters, 29 W. 39th street, New York.

Natrolin Metal Cleaner. W. A. Fuller Company, Greensburg, Pa.

Traction Dynamometers. For field testing of pulling power. John Chatillon & Sons, New York.

Crucibles. Price list and useful information, tables, etc. McCullough-Dalzell Crucible Company, Pittsburgh, Pa.

Pneumatic Grinders. Warner & Swasey Company, Cleveland, Ohio.

Synchronous Motors. Bulletin No. 875. Electric Machinery Manufacturing Company, Minneapolis, Minn.

Lighting Fixtures. "Red Spot" Hangers, and "Jiffy" Holder. F. W. Wakefield Brass Company, Vermilion, Ohio.

Industrial Poisons. Data sheets from the National Safety Council, Chicago, Ill.

Polishing Wheels. Price list and catalog from Advance Wheel Manufacturing Company, Chicago, Ill.

Lift Truck. Plimpton Lift Truck Corporation, Stamford, Conn.

Helical Springs. Some notes on their design and manufacture by J. W. Rockefeller, Jr. John Chatillon & Sons, New York.

Pyrometers. A complete and unusually handsome catalog including a considerable amount of thermal data. Republic Flow Meters Company, Chicago, Ill.

Snap Flasks and Pouring Jackets. Descriptions of cast aluminum taper snap flasks and taper steel pouring jackets. American Foundry Equipment Company, New York.

Electric Hoists—"Lo-Hed" electric hoists are featured in a catalog put out by the American Engineering Company of Philadelphia. A list of representative installations is included.

Heating System. A folder issued by Warren Webster & Company, Camden, N. J., illustrating and describing the Webster Systems of Steam Heating.

Electro-Chemical Pattern Scale. A scale enabling quick calculation for patterns made by electro-deposition as sold by Electro-Chemical Pattern & Manufacturing Company, Detroit, Mich.

Rotary Air, Gas and Oil Pumps and Sand Blasting Machines. A new catalog from Leiman Bros., New York, describing their wide range of equipment and its many industrial uses. The catalog is attractively illustrated and contains much interesting information.

Oil Circuit Breakers—A new 32-page bulletin, bearing the number 47495.1, has been issued by the General Electric Company describing four improved types of oil circuit breakers. The bulletin is well illustrated by photographs, tables and diagrams.

Frictionless Metals—A booklet issued by the Frictionless Metals Company of St. Louis, Mo., distributed by Charles F. Banks, New England sales manager, Boston, Mass. This booklet describes the various babbitts made by this company, and gives information on methods of using and handling.

Management Bulletins—Four bulletins issued by the Metropolitan Life Insurance Company, New York, on the following topics: Methods of Compensating Salesmen; Reducing Losses from Obsolete Material; The Spigot and the Bunghole (control of absenteeism); Auxiliary Equipment for Saving Man Power in the Foundry.

Grinding Wheels—A booklet has been published by the Norton Company, Worcester, Mass., entitled "The Balancing of Grinding Wheels." Among the chapters are the following: Advantages of Balancing the Grinding Wheel; Balancing Economy; Equipment for Balancing; Balancing for Precision Grinding. It contains illustrations.

ASSOCIATIONS and SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

AMERICAN ELECTRO-PLATERS' SOCIETY

MONTREAL CONVENTION

A few words from Montreal about our coming convention, June 29 to July 2, 1925.

"Well, John," said Frank, "what kept you so long getting this job done?"

"Oh!" said the plater, "it didn't take me so long."

"No?" asked the boss. "Then what kept it so long getting here."

"Oh!" said the plater, "I was waiting for the other fellow."

About six weeks ago we sent out our call for what we felt were our first requirements. That was a call to our big friends who help to set the stage. For what is the stage without a setting? You might ask what are the settings. Well, the settings for the first act are the program and our wonderful display of all the things that go to make the art of plating a little easier for the man who has to do it or who is responsible for having it done.

Quite a few of our good friends have got their spaces both in the program and exhibition hall; some only in the program. Some I have not heard from yet, but I feel sure they are just arranging things, and I will hear from them soon. On account of that I feel that I can now write you a few lines to say that I think Montreal will have a good show and a big one. The leading actors for the play are now studying their papers and I want to tell you fellows that have not yet reported, that you will have to hurry, for we hope to have our complete cast lined up before the end of this month. It would not be fair to give you a list now, or even hint of who they are, any more than to say that if you intend to prepare a paper to read, your name will be one of the Stars.

Now, no doubt quite a few of you who read this have never been in Montreal, and it is only fair to give you some idea of where and what Montreal is. Montreal lies on the bank of the great St. Lawrence River and is midway between the Great Lakes and the Atlantic Ocean. It is the largest city in Canada, has very nearly a million people and has possibly features that cannot be found in any city in the United States of America. The visitor can see here one of the most up-to-date harbors on the American continent, and also find, in the outlying districts, features dating back three centuries. Montreal is not so far away from so many of you, as it can be reached overnight from such places as New York, Boston, Buffalo, Detroit and the Connecticut Valley. Also, if you are coming by auto, there is a magnificent highway from New York with some of the greatest scenery that can be found anywhere. And then again, when you get here, you are going to find that the Mount Royal Hotel, where we are holding our convention, is as fine a hotel as any of you could wish for, and the arrangements that they have made for us and the things they are willing to do to make our convention a success could not be surpassed.

So we want you all to help. Don't forget that this is your first convention in Canada. Come one—come all. Don't let any stay at home and repent for years to come that they did not help to do their part to make this the educational event of their lives.

411 Aylmer street, Montreal, Canada.

J. H. FEELEY, Chairman Convention Committee.

BRIDGEPORT BRANCH

HEADQUARTERS, CARE OF R. J. O'CONNOR, P. O. BOX 671

At an open meeting Friday evening, April 17, 1925, which was attended by about seventy-five platers and manufacturers, a talk was given by a representative of the Electro-Chemical Laboratories of Montclair, N. J., covering Single Nickel Bath Control. A demonstration was given.

PITTSBURGH BRANCH

HEADQUARTERS, CARE OF S. E. HEDDEN, 227 FIFTH AVE., ASPINWALL, PA.

Pittsburgh Branch reports a most satisfactory and successful celebration from every standpoint. Their policy, patterned after a very successful wartime welfare organization of "Everybody welcome—everything free," was an original movement in this line.

Dean C. B. Connelly of the Carnegie Institute of Technology was the headliner of the speakers, giving a wonderful discourse on education. It will be interesting to the different branches of the association to know that through the dean, Pittsburgh Branch members have been invited to avail themselves of all the conveniences of Carnegie Tech at any future time they are needed.

General chairman, Wilfred S. McKeon, claims Pittsburgh Branch has always blazed the way in originality from several different standpoints.

The sixth annual party, held on Friday, April 17, consisted of a baked white fish dinner with everything that goes with it.

NATIONAL SAFETY COUNCIL

HEADQUARTERS, 168 NORTH MICHIGAN AVENUE, CHICAGO

The mid-year meeting of the National Safety Council's Chemical Section will be held at the duPont Hotel in Wilmington, Del., May 22 and 23. Among the subjects to be discussed by representatives of leading chemical companies of the United States are the following:

1. Treatment of chemical injuries caused by alkalis and acids.
2. Benzol poisoning.
3. Safe handling of materials in chemical plants (a round-table discussion).
4. Industrial ventilation as applied to harmful dusts, gases and fumes.
5. Avoiding the dangerous effects of corrosive chemicals on buildings and apparatus.

Personals

ROBERT J. ANDERSON

Robert J. Anderson, consulting metallurgical engineer whose new book on the "Metallurgy of Aluminum and Aluminum Alloys" is reviewed on page 200 of this issue by E. V. Pannell, was born in Cleveland, Ohio, July 10, 1892. His parents were Samuel Clark Anderson and Sarah Alice Brown Anderson. He received his preliminary education in the public schools of Cleveland, and the South High School, also of Cleveland. In 1914, he was graduated from the Case School of Applied Science of Cleveland as a B.Sc. in Metallurgy. In 1917, he obtained the degree of E.Met. at the Case School. He has since then taken courses in law at the La Salle Extension University, Chicago, and in business administration at the Alexander Hamilton Institute, New York. At the present time, in addition to carrying on his practice as a consulting metallurgical engineer, he is a graduate student in the Department of Metallurgy, Massachusetts Institute of Technology, Cambridge, Mass., studying for the degree of D.Sc. in Metallurgy.

ROBERT J. ANDERSON

Mr. Anderson's experience covers a wide range. In 1909 and 1910 he was a steel works apprentice at the United States Steel Corporation, Cleveland, Ohio, working on the labor gang in machine shops and the rod mill, etc. He spent the summers of 1911, 1912, and 1913 as chemist for the Grasselli Chemical Company of Cleveland, machinist for the Peerless Motor Car Company, Cleveland, and chemist for the General Chemical Company, Willow, Ohio. In 1914 and 1915 he was assistant superintendent for Jno. Moore & Son, contractors, Cleveland, working on building construction, drafting, etc. During 1915 and 1916 he was engaged as instructor in metallurgy at the Missouri School of Mines and acted as research metallurgist in the Missouri State Mining Experiment Station. Later he was engaged temporarily by the American Rolling Mill Company, Middletown, Ohio as investigator of problems on open hearth, blooming mill work and heat treatment of steel. He acted later as assistant to Dr. H. M. Howe at Bedford Hills, N. Y., and helped Dr. Howe to set up his laboratory when he removed from Columbia University.

In 1917 Mr. Anderson was chief chemist and metallurgist for the Cleveland Metal Products Company, Cleveland, Ohio, and engaged in work concerned with technical control in the production of aluminum and aluminum-alloy manufactures (rolling mill and foundry). In 1918 he became aeronautical engineer for the Bureau of Aircraft Production in Washington, D. C., Pittsburgh and Detroit, working mainly on production and application of aluminum and aluminum alloys to aircraft.

From 1919 to 1924 Mr. Anderson was metallurgical engineer for the United States Bureau of Mines Experiment Station, Pittsburgh, Pa., in charge of the Non-Ferrous Metals Section. He organized and developed the work in the metallurgy of aluminum and aluminum alloys, brass, and bronze, wastage of metals in industrial practice, corrosion and metal analysis. In 1923 and 1924 he lectured on metallography at the Carnegie Institute of Technology, Pittsburgh. Since 1924 Mr. Anderson has been a consulting metallurgical engineer, and as mentioned above, a graduate student at the Massachusetts Institute of Technology.

Mr. Anderson is the author of over a hundred publications consisting of papers for the technical societies, articles for the technical press, chapters in various handbooks and the above-mentioned book on the Metallurgy of Aluminum and Aluminum Alloys. He is a member of the following societies: British Institute of Metals; American Institute of Mining and Metallurgical Engineers; Franklin Institute; American Association for the Advancement of Science; Society for the Promotion of Engineering Education; American Foundrymen's Association; American Society for Testing Materials. He is a member of numerous committees of these societies, and chairman of several of them. He is also a member of Theta Tau, Tau Beta Pi and Sigma Xi fraternities.

R. A. Weaver, president of the Ferro Enamel Supply Company, Cleveland, Ohio, recently returned from an 8 weeks' trip to the Pacific Coast.

H. W. Hardinge, president of the Hardinge Company, New York, has been abroad on company business for over a month. He returned on the *Olympic*, arriving April 15th.

F. H. Bell, former editor of the Canadian Foundryman, Toronto, Canada, now is representative of the Frederic B. Stevens, Inc., Detroit, Mich., at the Windsor office.

Wallace W. Boone, assistant professor of metallurgy at the University of Cincinnati, has resigned from that institution. He has accepted a position as metallurgist for the American Radiator Company, Detroit, Mich.

C. B. Harvey, formerly branch manager of the Philadelphia territory for the complete line of Lapeer Semi-Trailers, made by the Lapeer Trailer Corporation, of Lapeer, Mich., has been appointed distributor for his territory.

M. A. Joy is in charge of the new Newark warehouse opened by the Chase Companies, whose headquarters are Waterbury, Conn. Mr. Joy is moving with his warehouse to 361 instead of 351 Halsey street, Newark.

R. W. Rowson, of Nicholas Paty., Ltd., Melbourne, Victoria, Australia, spent some time on business in New York. He was interested in aluminum bronze sheets for stamping into aspirin boxes, but found few manufacturers of such sheets.

Walter C. Gold, Philadelphia, Pa., has secured the services of **William R. Schofield** as salesman. Mr. Schofield has been plater for John Wanamaker, Philadelphia, and has had a practical and timely experience and knowledge of electro-plating in all its phases.

Marc Stern, after thirteen years of service in the capacity of chief engineer, has severed his connection with the Doehler Die-Casting Company, Brooklyn, N. Y. Mr. Stern acted as technical representative in connection with the sales department during the past year.

Louis E. Clarke, has been placed in charge of the Detroit branch of the Hoyt Metal Company, St. Louis, Mo., having been sales manager of the die castings and bearing department of the above company for the past five years. Mr. Clarke is now located at 304 Basso Building, Detroit.

Walter J. Allen, past supreme president of the American Electro-platers' Society, is representing the George A. Stutz Manufacturing Company, 1645 Carroll avenue, Chicago, Ill. in the entire state of Michigan. Mr. Allen was with the Keeler Brass Company of Grand Rapids, Mich., for 11 years.

A. P. Cobb, vice-president of The New Jersey Zinc Company, was elected president of The American Zinc Institute for the coming year at the annual meeting in St. Louis the last week in April. Mr. Cobb has been prominent in the affairs of the Zinc Institute since its formation, having filled until the recent election the position of vice-president and chairman of the Executive Committee.

H. D. Cushman, of the Ferro Enameling Company, is now operating the Pacific Enameling & Manufacturing Company, of Oakland, Calif. **Joe Paul**, formerly with the Wolverine Enameling Company, of Detroit, and **H. B. Nahler** are in charge of the Oakland plant, and **Paul Quay**, of the Ferro Enamel Supply Company, will spend about two months in Oakland getting new equipment installed.

G. H. Clamer, past president of the American Foundrymen's Association and a member of the board of directors, will present the 1925 American Foundrymen's Association exchange paper at the meeting of the Association Technique de Fonderie de France. This paper will be on a non-ferrous topic entitled "The Practice Followed in the United States in the Manufacture of Railway Car and Locomotive Bearings." Mr. Clamer has been employed in research and production work with the Ajax Metal Co., of Philadelphia, ever since his graduation from the University of Pennsylvania in 1897, having risen to the position of president of the company. Because of his researches in foundry chemistry and metallography, he was awarded the Elliott-Cresson gold medal, the highest award of the Franklin Institute. He has been active in promoting the welfare of the foundry industry and for a long time has been engaged in the affairs of scientific societies. Mr. Clamer is a past president of the American Society for Testing Materials, the American Institute of Metals and of the committee on Science and Arts of the Franklin Institute.

Obituaries

ADOLPHUS OTTO BACKERT

A. O. Backert, president of the Penton Publishing Company, Cleveland, Ohio, died Friday afternoon, April 24, 1925, at his residence, 13985 Lake avenue, Cleveland, from heart failure.

Mr. Backert was born at Cleveland, February 3, 1876, son of Anton and Jennie (George) Backert. He was graduated from Central High School and for several years attended Western Reserve University. After serving for several years as political reporter for the Cleveland World, he became associate editor of Iron Trade Review and The Foundry, being in charge of the Pittsburgh office from 1900 to 1906. He was western editor for the Iron Age with headquarters at Chicago from 1906 to 1908. Since the latter year he had been editor of The Foundry, and from 1908 to 1913 he was also engineering editor of Iron Trade Review. In that year he became vice-president and general manager of the Penton Publishing Company. In 1924 he was elected president and general manager of the Penton Company.

A. O. BACKERT

Mr. Backert was widely known throughout the foundry industry not only in this country, but also in England, France, Germany and even Australia. He was secretary-treasurer of the American Foundrymen's Association from 1914-1918 and was elected president of the association for the term of 1918-19. During its organization, he was secretary and later an honorary member of the Foundry Supply Manufacturers' Association. He was also secretary of the Foundry Equipment Manufacturers' Association from its inception.

Mr. Backert conceived the idea of the Allied Metal Congress which was held in Milwaukee in 1918. He went to Europe in 1919 to invite personally foreign foundrymen to the Inter-Allied Foundrymen's Convention and Exhibit at Philadelphia. While abroad he was the guest of honor at British foundrymen's dinners and of a number of leading British iron and steel and metalworking interests as well as in France.

Besides his business activities, he was the writer of a number of books and papers upon foundry practice. He was past president of the Associated Business Papers, Inc., member of the executive committee of the National Publishers' Association; member of the Iron and Steel Institute, London; of the American Iron and Steel Institute; of the American Institute of Mining and Metallurgical Engineers, and of the Cleveland Society of Engineers; honorary member of the American Foundrymen's Association; also a member of the Cleveland Chamber of Commerce, the Cleveland Athletic Club, the Clifton Club and the Rotary Club.

He was married to Beatrice M. Fielding, July 3, 1899, at Windsor, Ont. He is survived by the widow, his daughter Edith Beatrice, his mother and two sisters.

ELWOOD HAYNES

Elwood Haynes, inventor of America's first automobile and internationally known as a scientist and metallurgist, died at his home in Kokomo, Ind., following a brief illness.

Mr. Haynes was born at Portland, Ind., October 14, 1857. After obtaining the degree of Bachelor of Science from Worcester Polytechnic Institute, he taught school for three years, and then studied for a year at Johns Hopkins. In 1886 natural gas was struck in Portland, Ind., and he became manager for the local gas company, and then from 1890 to 1901 he was field superintendent for the Indiana Natural Gas and Oil Company. Thereafter, he devoted himself to his automobile business and his inventions. The improvements added by Mr. Haynes between 1895 and 1912 included a successful carburetor, the first automobile muffler and the use of aluminum in automobile engine construction. He introduced nickel steel into motor car construction, invented and built a rotary valve motor, and completed the first 1,000-mile trip in an automobile. Since 1912 Mr. Haynes had delegated the active management of his business to his associates. Other inventions credited to Mr. Haynes are various alloys, with special properties of wide practical use, among them stellite, an alloy of cobalt and chromium. This resulted from his search for a metallic combination that would resist the oxidizinz influences of the atmosphere and still preserve a good cutting edge.

RALPH C. DAVISON

Ralph C. Davison, mechanical engineer with the American Abrasive Metals Company, 50 Church street, New York, died at his home, 1202 Lenox avenue, Plainfield, New Jersey, on April 15th, of pneumonia after an illness of but 48 hours. He was 51 years old. After leaving Stephen's Institute, he engaged in foundry practice for several years and then went with the "Railway Gazette," where he was engaged in editorial work.

About 1909 he became connected with the American Mason Safety Tread Company, of Lowell, Mass., with whom he remained as engineer and as a director of the company until January 1, 1918, when he joined the American Abrasive Metals Company. With this company he was in charge of the safety work at its Irvington plant and was the representative of the company at conventions of the Steam and Electric Railway Association, where he had a very wide acquaintance as well as among the architects and construction engineers in the metropolitan district. He leaves a widow and one son.

WILLIAM MANLEY

William Manley died March 19, 1925, at the age of 67 years. He was connected with the firm of Leary and Manley, owners of the Queen City Foundry, Spring Grove avenue and Alabama street, Cincinnati, Ohio. Mr. Manley was born in Hamilton, Ont., Canada, and came to Cincinnati as a youth. He was in the foundry business 45 years.

WALTER P. FRENCH

Walter P. French, treasurer, E. J. Lavino & Company, the Lavino Furnace Company, the Lavino Shipping Company, and the Lavino Refractories Company, all with o... s in the Bullitt Building, Philadelphia, died on March 24 of pneumonia. He had been ill only two days. Mr. French was 4. years old. He leaves his wife, parents, two sisters and a brot...r.

NEWS OF THE INDUSTRY

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

NEW ENGLAND STATES

WATERBURY, CONN.

May 1, 1925.

Purchase of the **Morency-Van Buren Manufacturing Company,** of Sturgis, Mich., by the **Scovill Manufacturing Company,** of this city, will be an established fact by the end of the month, **E. O. Goss,** president and general manager of the local concern, stated, following reports of the acquirement of the Michigan company. Complete transfer of the stock to the Scovill Manufacturing Company will take about a month or six weeks, he said, by which time the Morency-Van Buren Company will be completely merged with the local concern. Contrary to the report of the sale involving somewhere near a million dollars, Mr. Goss said the valuation of the plant was about one-half million dollars. The concern makes a complete line of brass valves and plumbing supplies, similar to those manufactured by the Scovill Company, and its subsidiary, the **American Pin Company.** Mr. Goss stated that he considers the concern's mixing valve one of the best on the market. Its line of plumbing supplies will exactly complete and coordinate those made by the local company, he states.

While the mild slump, which began two months ago, still continues, leaders of local industry point out that it is not so bad as several slumps which have occurred since the war. **John H. Goss,** vice-president and general superintendent of the Scovill Manufacturing Company, says business has been falling off for the past 30 days and some departments are working but four days a week, although others are working overtime. It is stated at the office of the **Chase Companies** that business is fair but not so good as anticipated. **David C. Griggs,** general manager of the **Farrel Foundry,** states that immediate prospects for good business do not seem so bright as a few weeks ago and orders are falling off, but his plant is working full time and some departments overtime.

The **Waterbury Clock Company** is working but five days a week and orders are falling off slightly, it is stated. The **Randolph-Clowes Company** is working but 50 hours a week.

E. O. Goss, president of the **Scovill Manufacturing Company,** was one of the New England industrial leaders who had lunch with President Coolidge, last month, to talk over expansion of the Junior Achievement system of activities for city boys and girls, to teach them trades and old-fashioned house work and to combat "dangerous tendencies in American life."

Patents were granted during the past month to the following local brass workers: **Robert W. Hampson,** cigar and ash stand; **George A. King,** carpet fastener; **Charles E. Parsons,** feed mechanism for button attaching machines.

Joseph F. Walker, superintendent of the former **Benedict & Burnham** plant of the **American Brass Company,** and **William H. Callan,** superintendent of the former **Waterbury Brass** plant of the concern, resigned last month. Mr. Walker has been in the concern's employ 33 years, during 15 years of which he was superintendent. Mr. Callan has been employed by the company over 25 years, originally being with the **Birmingham Brass Company,** of Derby, later acquired by the American Brass Company.

Herbert W. Coe, works manager of all the plants of the American Brass Company in Waterbury, has resigned to accept the position of president of the **Ansonia Clock Company,** of Brooklyn, N. Y. He came here in 1912 as assistant superintendent of the **Waterbury Brass Goods Corporation,** a subsidiary of the American Brass Company. He later became works manager of all the local American Brass plants.—W. R. B.

BRIDGEPORT, CONN.

May 1, 1925.

F. J. Kingsbury, chairman of the Bridgeport Brass Company, and **Sumner Simpson,** president of the Raybestos Company, both of this city, were among the 36 New England industrial leaders who were the guests of President Calvin Coolidge on the 14th of last month, at a White House luncheon held in connection with the development of Junior Achievement Club work among city boys and girls.

Following the luncheon, the guests proceeded to the Mayflower, where another conference was held with the President relative to extension of the work. The President was said to be much interested in the plans of the local leaders for affording the city youth the opportunity to turn leisure hours into productive, remunerative work and to find their right niches in the industrial scheme, such as provided in Junior Achievement work, and which the leaders believe to be the best antidote for growing luxurious tastes and destructive habits.

The **Remington Arms Company,** of this city, has finally been decided the victor in the $3,000,000 patent suit filed against it by the **National Cash Register Company.** The Appellate Division of the Supreme Court of New York has reversed the judgment obtained by the National Cash Register Company against the local company which would have compelled the local concern to give up its patents for cash registers made by its subsidiary, the Remington Cash Register Company. The suit was based on an old employment contract between the National Company and Frederick Fuller, cash register inventor, later employed by the local company. The court held that his contract with the National Company expired in 1910, whereas he did not enter the local concern's employ until 1917, after which he designed the cash registers about which the suit is waged. The court holds that these registers do not infringe upon the patents held by the plaintiff.

Carl F. Dietz, president and general manager of the **Bridgeport Brass Company,** was elected president of the Rotary Club last month.

Anker S. Lyhne, president of the **Bridgeport Metal Goods Manufacturing Company,** left April 15th on the steamship Berengaria for Europe for a business trip. He will seek new ideas for the line of metal ornaments made by the plant here and also determine if Europe offers a market.

Sale of the property of the **Gaynor Manufacturing Company** will be effected at a foreclosure sale, Judge L. J. Nickerson decided, last week, to end the litigation which has involved the plant for some time. The Remington Arms has a judgment of $44,000 against the property and the City National Bank seeks to recover $64,000 lent on notes.

English interests have acquired a 60 per cent control of the **Columbia Phonograph Company.** The price paid for the 51,000 shares of stock is said to be $50 a share. **Louis Sterling,** managing director of the Columbia Company, Ltd., of London, has been made chairman of the board, and H. C. Cox, former vice-president and treasurer, has been made president. The local company, whose European interests were acquired three years ago by the **Constructive Finance Company, Ltd.,** reported for the 10 months ending December 31, last, a deficit of $35,164.

James Howard, 70 years of age, of 206 Wells street, an employee of the **Crane Valve Company** for the past 50 years, was retired, last month, on a pension. He came to Bridgeport in 1869 and started to work with the Burnham Company, which later merged with the Crane Company. He was at one time a member of the board of aldermen.—W. R. B.

NEW BRITAIN, CONN.

MAY 1, 1925.

One of the most important manufacturing deals consummated in Connecticut in some time went through on April 23 when the stockholders of the **Traut & Hine Manufacturing Company** voted to accept a proposition whereby this concern is purchased by the **North & Judd Manufacturing Company,** with buildings located adjacent. The North & Judd Company has agreed to pay $280,000 in cash and to assume a bond issue amounting to $215,000. The sale was voted 31,821 shares to 325. The Traut & Hine Company will liquidate and agree to remain out of business and not to allow the use of its name in any other industry. North and Judd buy all the assets except equipment for the manufacture of adding machines. They also take over all the contracts and liabilities and all leases outside of Connecticut, in addition to the buildings and hardware lines, bills receivable and book accounts; cash on hand and anticipated Federal tax refunds which may amount to a considerable sum. Taxes due the city of New Britain will be pro-rated and the purchaser gets all merchandise on hand or en route and agrees to fill all orders on hand. A six months lease on part of the Traut & Hine factory held by the **Type Adder Company** will stand but at its expiration the equipment will be moved to New Jersey. This company agrees to pay $2 on every machine produced until the total payment shall reach $43,000.

It is expected that the stockholders of the Traut & Hine Company will receive about $5 per share. **George W. Traut,** president of Traut & Hine, will become connected with the purchasing department of the North and Judd Company.

This purchase is regarded in business circles as very important as the Traut & Hine Company has been established for a great many years and is really a rival concern of North & Judd. Although it has been in straits for quite some time, it has not been a financial failure, it is said, as the plant itself has been reported as making money.

Other concerns about New Britain are doing only an average amount of business, and while conditions are reported as "good," they are not any too bustling. However, there is no appreciable slump, nor is there anything to indicate that there is any period of undue depression ahead. **Landers, Frary & Clark,** the **American Hardware Corporation,** the **Stanley Rule & Level Company** and the **Stanley Works** all are handling a good business and those in charge see nothing to cause them any worry or pessimism.—H. R. J.

PROVIDENCE, R. I.

MAY 1, 1925.

With a force of more than 200 workmen, as reported as rushing at the present time there is more work at the **Moss-Berg Company's** plant in Lamb street, Attleboro, than there has been at any time during the past five years, or since the war time rush orders. The plant, which is in receivership, showed, the first of this month, a fine report financially and those in the management of the concern are very optimistic from the very apparent improvement in business conditions.

Edmund C. Mayo, vice-president and general manager of the **Gorham Manufacturing Company** since June, 1924, was elected President of the concern at the meeting of the Board of Directors which followed the annual stockholders' meeting at the company's office at Elmwood on Wednesday, April 8. Mr. Mayo came to the Gorham Company as a vice-president in charge of production in January, 1924, and was appointed general manager in June of the same year. The office of president of the company has been vacant for some time. Before coming to Providence, Mr. Mayo was for five years President and General Manager of the American Tube and Stamping Company, of Bridgeport, Conn. and for five years previous to that was general manager of the Worcester Pressed Steel Company of Worcester, Mass. Other officers elected were as follows: Vice-Presidents—Alfred K. Potter, John B. Abbott and Arthur F. Hebard; Secretary—Hiram C. Hoyt; Treasurer—Alfred K. Potter.

The total indebtedness of the company to all banks has been reduced from $2,511,232 to $770,000, during the year, while the profits for the same period amounted to $325,901.63.

The reduction in the bank indebtedness, it is pointed out, has been achieved by the sale of the Fifth avenue buildings in New York, economies in operation and reduction in inventories and accounts receivable. The report says: "A re-arrangement of the Providence plant and a marked improvement in operation also have been accomplished, but your business will have to be substantially increased before the large amount of floor space can be properly used. Much remains to be done in solving the many important problems yet before us, and great patience and caution must be exercised until the bank loans and other indebtedness of the company can be paid off, and the business properly organized, solidified and increased."

A three-day weekly schedule is being operated at the plant of the **R. Plews Manufacturing Company,** at Central Falls, and with a reduced force of employes. The concern is engaged in the manufacture of tin cylinders and sheet iron, tin and copper materials. According to the management, increased business is looked for in the near future.

Specialty Products Company, Inc. of Providence, has been incorporated under the laws of Rhode Island for the manufacture of jewelry, with a capital stock of 100 shares of common stock without par value. The incorporators are Earl A. Kupfer, Frank D. White and E. Butler Moulton.

J. P. Clinton has established a lacquering plant at 158 Thursber's avenue, Providence, and is doing a rushing business on refinishing automobiles.

A. Morris & Company, Inc., of Providence, has been incorporated under the laws of Rhode Island, with a capital stock of $25,000 consisting of 500 shares common of $50 each. The incorporators are Morris Mistowsky, Alexander Weiner and Philip V. Marcus.

The T. J. Allen Enameling Company, 174 Chestnut street, is being conducted by Boghos Sahagian, according to his statement filed at the city clerk's office.

The **North Attleboro Welding Company,** William McGovern, manager, 45 East street, North Attleboro, reports increasing number of orders on autogenous welding.—W. H. M.

MIDDLE ATLANTIC STATES

TRENTON, N. J.

MAY 1, 1925.

Trenton metal manufacturers report business conditions as being good at the present time and see no reason why there should not be a good summer season. **William G. Wherry,** president of the **Skillman Hardware Manufacturing Company,** who has just returned from a business trip in the south, reports business as picking up. The Skillman Company reports orders as being on the increase. The **Trenton Emblem Company, Trenton Brass & Machine Company, Billingham Brass & Machine Company** report business as improving. Orders have also increased at the plant of the **J. L. Mott Company.**

General creditors of the **Bertrand F. Miller Company,** manufacturers of radio parts, will receive about 25 cents on the dollar, according to an accounting and final report filed by S. Leslie Tattersall, receiver.

Charging that the **Circle Manufacturing Company,** of Trenton, has engaged in the unlawful manufacture of a patented socket for incandescent lamps, **Harvey Hubbell, Inc.,** of Cleveland, O., has filed suit against the Trenton concern in the United States District Court. The Cleveland firm asks that the defendant be restrained from further manufacture of the socket and seeks a decree awarding all profits derived from the alleged illegal sale of the socket for more than six years.

The **American Car & Foundry Company,** of Jersey City, N. J., has changed its issue of 300,000 shares of common stock at $100 a share into 600,000 shares with no par value. In addition, the concern has a capital of 300,000 shares of preferred stock at $100 each, which remains unchanged. An

amended certificate was filed in the office of secretary of state at Trenton.—C. A. L.

PHILADELPHIA, PA.

May 1, 1925.

The Philadelphia non-ferrous metal market, like most others throughout the country, now is in the midst of a depression which his continued for some time, without the least indication of any notable improvement in sight. Buying is on a very small scale with most consumers seeking bargains, disregarding the fact that copper, the usual leader of the market, has reached the lowest level of the year. Some small quantities of sheet copper have been recently taken by home builders for roofing material. Copper pipe is not in much demand. Ingots are slow in moving. Survey of the consumer's stocks show that these are slight and the only hope merchants have are that these soon will be depleted, forcing an entry into the market. Lead sales are confined to a few small parcels with merchants eagerly soliciting any possible indication of a prospective sale. A few inquiries have been received, just enough to keep the merchants interested in this particular market.

Zinc sales have decreased and prices have reached a new low level. Virtually the same remarks are made by merchants regarding zinc as are asserted for copper and lead. There is a slightly better interest to inquiries in the last week.

Only a few sales are being made in the nickel market.

There is a growing increase in sales of scrap metals with prices gradually seeking higher levels.—A. F. C., Jr.

PITTSBURGH, PA.

May 1, 1925.

A slight increase in business activities, in the metal industry, in Pittsburgh, Western Penna. and Tri-State districts, is noted. After working through a period marked by slow business, showing a decrease of over 10 per cent from preceding years in most goods and a greater percentage off in many lines, local hardware dealers are hopeful with the entrance of the spring months that sales will return to normal. Kitchen utensils of aluminum quality are selling fairly well, while those of the enameled type are falling off.

A strong market started in the screen window and door line beginning the first of this week. Sporting goods handled by hardware dealers, such as rifles, revolvers, fishing articles and the like, have fallen off during the past months and so far this year are far below those of previous years. Radio accessories, taken up recently by many of the local dealers, are continuing strong with slightly lower prices.

The **General Fireproofing Company,** a Pittsburgh concern, is operating its metal furniture department at capacity, and reports increasing demand for fireproofing building materials, with heavy spring demand in sight.

Construction of a plant to manufacture bronze gold paint and enamels will be started by the **O. Hommel Company,** of Pittsburgh, at Puladki, 15 miles north of New Castle, Pa. The Hommel Company has purchased the site and water rights of a flour mill destroyed by fire two years ago and will operate its plant by water power.—H. W. R.

MIDDLE WESTERN STATES

INDIANAPOLIS, IND.

May 1, 1925.

The **American Zinc Products Company,** of Greencastle, Ind., reports steady aperations over the year just passed, and a good demand for its products.

The company manufactured rolled zinc sheets and plates and a wide variety of roofing products, chiefly for industrial buildings. There is an increasing demand for roofing materials of permanent material, such as a zinc sheet affords, this demand coming chiefly from the larger corporations and railroads. During 1924 carloads of corrugated zinc sheets were shipped to all parts of the United States, Hawaii and the West Indies.

A tablet of Stellite, the alloy discovered by **Elwood Haynes,** will mark the site of the cottage in which Mr. Haynes planned and invented America's first "horseless carriage," it was announced shortly after the death of the inventor at his home in Kokomo, Ind. Erection of the memorial is to be under the direction of the historical society of the county. A suitable legend, together with a portrait of the inventor and a picture of the first car, will be engraved on the tablet. The Kokomo Rotary Club, which started a movement for the erection of a memorial to Mr. Haynes is considering a suggestion for a municipal colliseum. A further suggestion is that mural paintings on the walls of the interior of such a memorial depict the progress of transportation form the dawn of history to the present time.—E. B.

DETROIT, MICH.

May 1, 1925.

The **Grand Haven Brass Foundry,** at Grand Haven, will erect an addition to its factory, to increase its facilities for caring for its rapidly growing business.

The **Acme Stamping & Brass Works,** at Zeeland, Mich., has been incorporated with a capital stock of $25,000 for the purpose of engaging in the manufacture of castings and doing metal stamping. The stockholders are John A. Donia, Jacob A. Elenbaas and John DePress, all of Zeeland.

Michigan manufacturers and others employing labor are considerably concerned over the bills recently introduced in the state legislature regarding workmen's compensation. Many of them fear the proposed laws will bar weak workers, cut wages and place the state at a disadvantage. The measures have had a number of hearings but it is not probable they will be finally acted on for some time. The manufacturers are in hopes the "sting" will be taken out of them before they are finally passed.

Since the recent installation of the new nickel plating method by the **Olds Motor Works** at Lansing, all cars manufactured by this concern are carrying parts treated to a heavy nickel plating of a uniformity of thickness never before achieved. The new method not only improves the work done, but it also conserves labor. The principal innovation in the method is an endless chain which conveys the articles being plated through the plating tanks at a set speed. This gives each part just the exact time in the plating bath that will give the best results. Three men using the new equipment can plate in a day 300 pieces of each of the nickeled parts on Oldsmobiles.

It is announced that **George A. Maher** has been chosen vice-president and general manager of the **Ireland & Matthews Manufacturing Company** of Detroit. At the same time announcement is made of the appointment of **L. L. Blake** as director of sales. Mr. Blake, for four years manager of the Standard Parts Company of Indiana, is also well know to the industry. Mr. Maher will shape the future policy of Ireland & Matthews in marketing the automobile products manufactured by the company.

George E. Edmund, president of the Edmund & Jones Corp., of Detroit, announces that seven additions have been made to the company's type 20 headlight distributing organization.

At the first annual meeting of the newly consolidated **Bohn Aluminum & Brass Corporation,** the 1924 earnings statement was made public. The corporation is a consolidation of the Charles B. Bohn Foundry Company and the General Aluminum & Brass Company. These companies operating individually until November 15, 1924, and from then to January 1 1925, in consolidated form, made total sales of $6,207,795.26. It is estimated that sales for 1925 will be not less than $7,500,000 and owing to the great economy of operation due to consolidated management, it is expected a very satisfactory profit will be made. The three plants of the corporation manufacturing aluminum castings and pistons and bronze bearings, are operated at capacity and are said to have orders ahead of sufficient volume to keep them going full blast until July 1 next. It is stated the company today is without obligations except current accounts payable and its issue of first mortgage bonds. The ratio of current assets to liabilities is approximately 4 to 1. Inventories at the consolidation date were $1,833,958.56. The December 31 statement shows a reduction

to $1,433,405.81 and since that date there has been a further reduction.

General business conditions have decidedly improved in Detroit during the last month. The automobile industry is holding up fairly well and the outlook is favorable for a fair business in the copper, brass and aluminum field. Most of plants report orders ahead or in sight to keep them busy for a considerable time. Conditions in general, however, are not so good as they were a year ago at this time. Competition is quite keen and a considerable effort is necessary in order to keep orders coming in.—F. J. H.

CHICAGO, ILL.

May 1, 1925.

Metal markets in Chicago are characterized by the general hand-to-mouth dealing that is prevalent in nearly all industries. Buyers appear extremely cautious, it is said, but the outlook appears quite promising.

At a meeting of the board of directors of the **Illinois Zinc Company,** held in Chicago recently, **Leland E. Wemple,** for the last eighteen months vice-president and general manager of the company, was elected president to succeed **Benjamin G. Wells,** resigned. **John M. Goetchius** of New York was re-elected chairman of the board, and **R. E. Meyer** was renamed secretary.

According to figures recently published by the Hawthorne works of the **Western Electric Company,** one-eighth of the country's supply of lead and nearly as much of the output of copper came into Chicago last year solely for use in lead covered telephone cable.

Plans for a one-story brass foundry to cost an estimated $7,500, have been prepared for **John Michels.** The plant will be built at North Mango and Grand avenues, and will measure 30 by 75 feet.

Several thousand dollars in damage was suffered by the **F. J. Phillips & Sons,** brass founders, when fire attacked their plant at 616 West Monroe street recently.

The **Central Plating Company,** nickel platers, also incurred a small loss due to fire which attacked their building at 401 South Clinton street, a short time ago.

The **Club Aluminum Company** has announced an increase in stock from $50,000 to $250,000.

The **Barnes Zinc Products Company,** La Salle, Ill., has announced a change in location to 900 Blackhawk street, and also an increase in stock from $100,000 and 2,000 shares no par value, to $100,000 and 8,000 shares no par value.

The **Kerr Wire Company** has leased the first floor of the building at the Southeast corner of Whipple street and Carroll avenue for a period of ten years at a term rental of $42,000, according to a recent announcement by the company.

John G. Ostrander, president of the **Ostrander-Seymour Company,** electrotypers, stereotypers and photo-engravers, died recently at his home in Chicago. He was 54 years old, and had succeeded his father, the late John W. Ostrander, as head of the company, in 1917.

The **Roscoe Metal Products Company,** 1522 South Fifty-second avenue, Cicero, Ill., has recently been chartered at a capital of $15,000 to manufacture and sell all manufacturers' products. The incorporators are Walter R. Holton, Clarence Kammerman and Howard S. Cartwright.

The **Aetna Tinning & Plating Company,** 4857 South Dearborn street, has recently been incorporated to design, manufacture and generally deal in goods, articles and commodities made or manufactured from tin, tin metal, sheet metal or any other metal. The incorporators are Charles J. Goetz, Benjamin Yacher and Anita Haritonoff. The firm is capitalized at $25,000.

The **Federal Rag & Metal Company,** 2035 Federal street, has been capitalized at $5,000 to operate the business of manipulating, buying, selling and dealing generally in junk materials and scrap metals. The incorporators are Harry Dubin, Belle Dubin and Alex. H. Rosenbaum.

The **Omco Metal Company, Inc.,** 521 South Kedzie avenue, was recently chartered with a capital of $10,000 to manufacture and deal in metal, and to conduct a foundry. The incorporators are Ciel S. Robinson, H. P. Orgel and Emil A. Schmaus.

The **Steiner Iron & Metal Company,** 1103 South Washtenaw avenue, was recently charatered to buy, sell and deal generally in new and scrap iron and metals of all kinds. The incorporators are George Steiner, Frank Steiner and Henrietta Feiner.

Other incorporations of interest to the trade are:

Stern Diamond Company, 31 North State street. Capitalized at $10,000 to manufacture, buy, sell, export, import and generally deal in jewelry, gold and silver. Incorporators: Robert Friend, Emanuel Stern and Henrietta H. Stern.

The **Blackhawk Manufacturing Company,** 1826 North Tripp avenue. Capitalized at $5,000 to manufacture, purchase and sell all articles of iron, metals, wood and composition of every kind or combination. Incorporators: John Kluson, William E. Glatt and Elizabeth Glatt.—L. H. G.

OTHER COUNTRIES

BIRMINGHAM, ENGLAND

April 17, 1925.

Business in the metal trades, of which Birmingham is the center, is gradually expanding, as indicated by the Board of Trade returns. The large orders for locomotives has involved contracts for brass, bronze and copper tubes, fire boxes, etc., and in regard to general brasswork a series of small reductions have followed the decreased values of copper. Several industries have benefited from increased activity in house building, the makers of electric fittings being busy, while several manufacturers are contributing in one way or another the necessary apparatus and fitments for wireless installations, which are becoming very popular.

An important change in connection with housebuilding is the substitution of copper for lead tubes for water conveyance. It is possible, of course, to use a lighter gage of metal than is necessary for lead, and when this is taken into consideration, with other economies, copper tubes have been said to work out at about £7 for a given quantity as compared with £12 for lead.

Progress is also being made in the use of metal fronts for the larger class of shops. Electric welding is being increasingly applied in a variety of Midland industries. It is now being used extensively in the Birmingham metal trades for the welding of brass wire and it is especially applicable to the jointing up of brass strip after slitting.

The silver trade is rather quiet, cheap electro-plate being preferred by householders. A few contracts are being arranged for hotel requirements, but the silver trade misses keenly the large orders which could be depended upon, formerly, for the equipment of naval and commercial vessels. Metal plants would benefit by increased shipbuilding.

One of the signs of the fairly healthy state of the Birmingham metal trades is the very low proportion of unemployed, and skilled men out of work is an experience almost unknown. Applications are being daily received for efficient brass casters and machinists for whom employment could be found, but the men are not to be had.

The various branches of the aluminum industry are very active, this metal being extensively used in the manufacture of engines and parts for motor cars, lorries, etc. Domestic hollow-ware in this metal has also cheapened considerably, although its price scarcely compares with that of goods supplied by Germany. The trade received a very useful stimulus from the British Industries Fair.

STANDARDIZATION OF METALLURGICAL MATERIALS

General complaints over the needless multiplication of sizes, qualities, etc., in metal products was the dominant note in a discussion by the **Birmingham (England) Metallurgical Society** on April 2, 1925, on the Standardization of Metallurgical Materials. Several leaders of the metallurgical industries of Birmingham took part in the discussion which was opened by **C. Le Maistre,** secretary of the **British Engineering Standards Association.**

E. W. Mullins, representing the **Cold Rolled Brass & Cop-**

per Association, cited examples of economies effected, but thought that in no case should they sacrifice quality which was one of the standards of British industry. It was absurd to suppose that standardization would needlessly publish the secrets of manufacturers to their customers. He gave examples of the unnecessary multiplication of sizes and patterns involving enormous cost. He thought the greater progress in American standardization might injure Great Britain because the Americans used their standards as a reason for inviting the placing of contracts.

Several other speakers supported the argument for standardization but thought it would be more satisfactory for standards to be arrived at by consultation between manufacturers and engineers.

Mr. Hayes, a Birmingham metallurgist, mentioned the great waste involved by the casting of ordinary brass strip in 35 to 50 different sizes.

Everybody could give examples of absurd duplication of sizes. For example he knew where an order was given for two articles of 5/16" width, two at 3/8" and two at 7/16" to three different manufacturers. One width would have done quite well for the whole order. In rolled metal everybody wanted a peculiar width and thousands of widths were ordered where a fractional difference was of no importance whatever.

Dr. Leslie Aitchison considered that a great deal of the trouble in needless multiplication of sizes was due to the giving out of orders by government departments. Many of the specifications were merely intended to help inefficient inspectors. Obviously the metal trades would benefit if proper consideration were given to the subsequent use of the metal. For example, it would be absurd to treat curtain poles on the basis of tensile strength. When certain properties were decided upon whether mechanical, electrical or otherwise, a good deal of latitude should be given to the manufacturer as to the way those properties were to be secured. As to the amount of lead in quick turned brass, was that a matter which required to be definitely settled. In many cases a wide margin could safely be left.

Mr. Hayes said he believed in German rolling mills the practice was to produce on a large scale cold rolled brass strip to standard sizes and so they were able to meet requirements from their larger stocks. A great saving would be effected in Great Britain if some such plan were adopted. In an average rolling mill it was quite common for ordinary cast strip to be produced in between 35 to 50 different sizes. The reduction of those varieties would save an enormous outlay.

Mr. LeMaistre said the Americans had probably moved somewhat more quickly than Englishmen and in America standardization was taking a tremendous place in all their activities. Probably the English were more conservative and inclined to study quality rather than quantity. But progress had been made since the formation in 1901 of the British Engineering Standards Association. They began first with electrical engineering, then general engineering and were now busy on screw threads.—J. H.

Business Items Verified

The **Matthews Company** announces the removal of its factory to the new building, 137-141 Coit street, Irvington, N. J.

The **Falcon Bronze Company** of Younstown, Ohio, has acquired the plants of the Lumen Bearing Company at Youngstown and Pittsburgh, Pa.

L & S Electric Company has taken the store at 210 Centre street, New York, with a stock of new and used motors, dynamos, air compressors and blowers.

M. Silberman and **I. Mittnick** have purchaser the U. S. polishing and Plating Works, at 516 Courtlandt avanue, New York City. This concern does a general job plating business.

Myown Electro Plating & Polishing Company has taken the building at 146 Navy street, Brooklyn, N. Y., where a shop has been opened for job plating in gold, silver, nickel, brass and copper.

The **Ferd Messmer Manufacturing Company,** 2700 S. Seventh street, St. Louis, Mo., has changed its name to the **Messmer Brass Company.** The personnel, plant and policy remain unchanged.

Ferrell Brass Foundry, Los Angeles, Calif., has removed to its new location, 1646 Tarleton street. The company makes brass, bronze and aluminum castings, including ornamental and architectural work.

L. Kuslansky has purchased the Williamsburg Century Plating Company plant at 89 Wallabout street, Brooklyn, N. Y. This concern does a general job plating business, specializing in die castings.

American Nickeloid Company, Peru, Ill., has let contract for substantial addition to its Walnut, Pa., factory which will materially increase production at that point. Main offices of the company will remain at Peru.

Alberto Dagortino, formerly a member of the firm of Ideal Plating Company, has opened a shop at 89 Wallabout street, Brooklyn, under the name of Wallabout Plating Works, where he will specialize in nickel plating.

Niagara Falls Smelting & Refining Corporation, 1070 Niagara street, Buffalo, N. Y., is in the market for briquetting machines for making metal bricks, 12 x 5 x 5, 11 x 4 x 4. This firm operates a smelting and refining department.

The **John A. Roebling's Sons Company,** Trenton, N. J., manufacturer of wire rope, cables, etc., has filed plans for a one-story addition, 96 x 158 ft., to cost about $40,000. This firm operates the following departments: galvanizing, rolling mill, tinning.

The **Southern Plating Works, Inc.,** 805 Broadway, Little Rock, Ark., are planning for extensions and the installation of additional equipment. J. E. Goetschius is general manager. This firm operates the following departments: plating, polishing and lacquering.

The **General Electric Company** has announced an average reduction of 10 per cent on standard types of polyphase induction motors in sizes from 1 to 15 horsepower inclusive, and an average of 4 per cent in sizes from 15 to 100 horsepower inclusive, both effective April 6.

Arcione Electro Plating Company, 233 18th street, West New York, N. J., has plans for a two-story metal plating works, 80 x 100 ft., to cost $50,000 with equipment. This firm operates the following departments: grinding room, plating, polishing, lacquering.

Jenkins & Gripe, Otis Building, Chicago, Ill., recently organized, will represent the Baltimore Tube Company, Inc., Baltimore, Md., manufacturer of sheet brass and bronze, roll and strip copper, bus bar copper, seamless brass and copper tubing, condenser tubes, copper anodes.

Plans for an addition to the foundry of the **New Brass Ware Company of Canada,** Ltd., Montreal, Canada, are being redrawn. This firm operates the following departments: brass, bronze and aluminum foundry; brass machine shop, tool room, grinding room, soldering, polishing and lacquering.

The **Sheets-Rockford Silver Company,** recently organized, has a plant at 1008 Mulberry street, Rockford, Ill., and will manufacture hollow ware, silver and plated goods. This firm will operate the following departments: casting shop, spinning, plating, rolling, stamping, soldering, polishing, lacquering.

The **Lee Tire Chain Industries,** Jefferson City, Mo., manufacturers of automobile tire chains, etc., are planning for enlargements and the installation of welding apparatus, electroplating equipment and other machinery. This firm operates the following departments: galvanizing, brazing, plating, stamping.

C. B. Bohn Foundry Company and the **General Aluminum & Brass Manufacturing Company,** Detroit, Mich., have been consolidated and will be known as the **Bohn Aluminum and Brass Corporation.** Both plants will be operated, and the offices will be maintained at Grand Boulevard and St. Aubin avenue, Detroit.

The **S. Obermayer Company,** Chicago, Ill., has just let contracts for installing equipment at its Cincinnati, Ohio, plant, to extend its activities in the manufacture of refractories: Hott-Patch, Esso Bond, Esso No. 33, No. 40, and its Ramtite

plastic fire brick material. This new manufacturing unit will cost approximately $25,000.

The **National Smelting & Refining Company,** 1842 Illinois avenue, Detroit, will erect a new plant at Ecorse, Mich., to cost $100,000 with equipment. Harry Greene is secretary and treasurer. This company smelts brass, bronze, aluminum and white metals. It is in the market for handling and concentrating equipment and refining furnaces.

The varied activities of the **William Cramp & Sons Ship & Engine Building Company, Philadelphia, Pa.,** enabled the company to show a substantial profit for 1924 with excellent prospects for increased business in every department during 1925, according to the annual report submitted to the stockholders April 30, 1925, by President J. Harry Mull.

Grand Travere Metal Casket Company, Lake avenue and Ninth street, Travere City, Mich., organized with $25,000 capital stock, will manufacture metal caskets and undertakers' supplies. It has purchased a building, has installed the necessary machinery and operates the following departments: casting shop, plating, stamping, tinning, soldering and lacquering.

The **Hoskins Manufacturing Company,** Detroit, Mich., now using two electric induction furnaces in the production of chromel and similar alloys, recently ordered a third electric unit. The two original furnaces are of General Electric manufacture and the third, now on order with the General Electric Company, will be of the latest type with the winding located above the bath and cooled by air blast.

The **Callender Soldering Process Company,** 2531 W. 48th street, Chicago, Ill., announces the installation of the Rubberline tank lining by the following concerns: Vortex Manufacturing Company, Chicago; O. K. Plating Company, Cincinnati, Ohio; Chicago Tube & Iron Works, Chicago; F. W. Miller Heating Company, Chicago; Federal Re-tinning Company, Chicago; Northwestern Plating Company, Chicago.

The **Trico Fuse Manufacturing Company,** at Milwaukee, Wis., announces the addition to its engineering staff of **William T. Clark.** This company manufactures Trico powder-packed time-limit renewable fuses and recently marketed the new Trico "Kantark" Non-Renewable Fuse line. Mr. Clark will devote the greater share of his time and ability to user service on problems arising in connection with particular or unusual installations.

The **Acme Stamping & Brass Works, Inc.,** Zeeland, Mich., recently organized, plans the erection of a building for the manufacture of brass and aluminum castings, forged brass and metal stampings. The company intends to do mostly job work. The following departments will be operated: brass and aluminum foundry, brass machine shop, grinding room, plating, stamping, polishing, lacquering. John Glupker and Jacob A. Elenbaas, both of Zeeland, head the company.

The **Hanson & Van Winkle Company,** Newark, N. J., manufacturer of plating and polishing supplies, has discontinued its Providence, R. I., office at 36 Garnet street, and has made jobbing connections with the **Quaker City Felt & Supply Company,** 274 Washington street, that city, which is stocking a full line of equipment and supplies. H. A. Libbey, factory salesman for the Hanson & Van Winkle Company, is working in conjunction with the Quaker City Company.

Grand Haven Brass Foundry, Grand Haven, Mich., has negotiations under way with the **Kelly Valve Company,** Muskegon, Mich., to take over its valve production, and when arrangements are consummated all manufacture will be carried out at the Grand Haven plant. Plans are under way for a one-story addition, as well as the transfer of considerable equipment from the Muskegon works. The following departments will be operated: brass, bronze and aluminum foundry, brass machine shop, tool room, grinding room, plating, stamping, polishing.

The new airplane manufacturing plant to be erected at Hammonton, N. J., will be owned and occupied by the **Anderson Aeroplane Corporation,** Atlantic City, N. J., recently organized by William S. Anderson of that place, and associates. A site of 22 acres has been acquired near the White Horse Pike and Plymouth Road. The initial works will be 200 x 300 ft., with several smaller buildings, and will make a specialty of small aeroplanes with aluminum wings, etc. This firm will operate the following departments: aluminum foundry, tool room, grinding room, casting shop, cutting-up shop, japanning, rolling mill, soldering, polishing, lacquering.

The **Electro-Chemical Laboratories** of Montclair, N. J., announce that among the users of their method of controlling nickel baths are the following: Boyce Moto-Meter Company, Yale Electric Corporation, American Tube & Stamping Company, Harvey Hubbell, Inc., American Safety Razor Corporation, J. E. Mergott Manufacturing Company, J. L. Sommer Manufacturing Company, Kraenter & Company, Smith & Hemenway Manufacturing Company, Standard Gas Equipment Corporation, Waverly Musical Intrument Company, Roberts & Wander Stove Company, Jenkins Manufacturing Company, William M. Crane, Consolidated Safety Pin Company, Whitehead & Hoag, Boorum & Pease, Hudson Brass Works, E. Poetes & Company, Karl Oswald Company.

EVERLASTING METALS AND ARCHITECTURE

The International Exposition of Architecture and Allied Arts was held in Grand Central Palace, New York, April 21-May 2, 1925. The Exposition showed a large number of interesting uses for metal products in building and architectural work, among which were the following: metal furniture, pneumatic tubes, architectural iron, brass and bronze; bronze statuary, silver ware, plumbing and bathroom fixtures, steam fittings and supplies, refrigerators, roofing, piping, flashing, leaders and spouts, lighting fixtures, clocks, enameled cabinets, telephone instruments, floors of abrasive materials, cork and insulation, industrial cleaners.

An unusual exhibit of small statuary was "Star Dust," by Alfred David Lenz, of Flushing, L. I., which was awarded the Avery prize. This piece was described and illustrated in THE METAL INDUSTRY for January, 1924, page 14.

A number of firms interested in metals were among the exhibitors. Some of the most important were as follows: American Brass Company, Waterbury, Conn.; Eagle-Picher Lead Company, Chicago, Ill.; National Lead Company, New York; E. I. Du Pont de Nemours & Company, Inc., Paint and Varnish Division, Philadelphia, Pa.; Superior Skylight Company, Inc., New York; Taunton-New Bedford Copper Company, Taunton, Mass.; Copper & Brass Research Association, New York.

The booths and products shown by the American Brass Company and the Taunton-New Bedford Company were particularly attractive. The Copper & Brass Research Association featured the slogan "Everlasting Metals," coined in THE METAL INDUSTRY in the January, 1925, issue.

INTERNATIONAL COMPANY CONFERENCE

Sales engineers from middle western territories attended the spring sectional Idea Conference of the International Chemical Company of Philadelphia, Pa. This was held at Hotel LaSalle, Chicago, on April 3, 1925. Technical problems encountered in the application of international potashes, cleaning compounds and lubricants were fully discussed. Such things as methods and materials to be used in cleaning oil barrels, tank cars, paper mill felts and tire molds were carefully gone into. Results obtained on these problems in various tests were carefully compared and a general check up made.

Several very interesting technical problems that have recently been solved aroused much interest, particularly removing fuel oil sludge from tanks, the cleaning of aluminum ham boilers, and the cleaning of tire molds. A new material for heavy duty cleaning in railroad shops, and a new japan stripper which is said to strip in less than half the time of anything heretofore put upon the market, came in for discussion.

CORNISH PREDICTS BETTER BUSINESS

"The world is looking to the farmer to become a consumer next Fall," E. J. Cornish, president of the National Lead Company, told stockholders. "This will naturally mean improved business in all lines." Mr. Cornish said that the "great prosperity" which began last August was due to better farm prices.

In reviewing the year 1924 in the business of the National Lead Company, he said, it started with splendid conditions prevailing in the company's field. Later, however, prices started to decline and they had been on the downward trend ever since.—NEW YORK TIMES.

ROLLED ZINC IN 1924

Reports made by producers to the Department of the Interior through the Geological Survey show that the production of rolled zinc in 1924 was 9 per cent greater than in 1923, and was the largest since 1918, the banner year.

The quantity of rolled zinc imported for consumption in 1923 was very small. The amount important during the first nine months of the year indicates that the imports in 1924 also were small.

ROLLED ZINC IN THE UNITED STATES IN 1923 AND 1924

	1923			1924		
		Value			Value	
	Pounds	Total	Average	Pounds	Total	Average
Sheet zinc not over one-tenth inch thick	49,179,501	$4,529,075	$0.092	59,033,193	$5,669,867	$0.096
Boiler plate and sheets over one-tenth thick	2,294,230	186,415	.081	1,982,526	160,893	.081
Strip and ribbon zinc	60,192,743	5,449,491	.091	61,049,000	5,721,594	.094
Total rolled zinc	111,666,474	10,164,981	.091	122,064,719	11,552,354	.095
Sheet zinc imported and entered for consumption	584	41	.070	[1]712	[1]88	.124
Rolled zinc exported	7,463,362	764,369	.102	7,315,144	784,728	.107
Available for consumption	104,203,696	....	......	114,750,287	....	......

[1]Figures available for first nine months of year only.

Compiled by C. E. Siebenthal and A. Stoll.

GROWTH OF BRIDGEPORT

Bridgeport, Conn., not content with being known the world around for its diversified manufactures, is setting aside the week of May 30—June 6, 1925 for visualizing itself to itself and to outside visitors in a very comprehensive program depicting the growth of the city and its institutions. During the past fifty years Bridgeport has added an average of forty-nine per cent to its population each ten years and has multiplied itself more than twenty-three times in wealth. It has grown from a town of 1,800 people to a city of more than 150,000 population. In 1875 its grand list showed its wealth to be estimated at $12,000,000. Today it is over $257,000,000.

The Exposition, known as Progress Week, will give as complete a picture as it is possible to stage under one huge tent of concrete examples of the manufactures and other assets which go to make up Bridgeport's wealth.

The 443 manufacturing plants, which turn out more than 5,000 products, give unlimited scope for diversified displays, which will be staged with professional skill for artistic and dramatic effects. Not only locally manufactured products but the wares of local merchants, the demonstrations of banks, public utilities, city departments, civic, social and other organizations will make this the most comprehensive effort to picture the community life of a city in all its aspects that has ever been attempted in New England.

The Chamber of Commerce is promoting this exposition, aided by 36 civic, social, professional and business organizations of the city. Committees include 400 prominent men in all walks of the community life. The profits realized from Progress Week are to be devoted to the establishment of an Industrial Bureau, to bring desirable new industries to Bridgeport.

MAKE MERCURY HEAVY AS GOLD

Workers at the Kent Chemical Laboratory at the University of Chicago are experimenting with a new machine. They already have been able by its use to change the weight of mercury put into the machine, but so far are baffled in their efforts to change the metals appearance. The mercury now transformed, it is said, has the weight of gold, though it does not look like it.

A statement reads as follows:

"Work has been begun in this laboratory on the method by means of which electrons with thousands of times higher velocities are shot into mercury in order to see if they attach themselves to the murcury nucleus and thus produce gold. It is the opinion of those who have begun this work that even these greater concentrations of energy will be insufficient, and that still more powerful and expensive sources of energy may be needed to be applied."—New York Times.

INCORPORATIONS

John F. Abernethy announces the incorporation of the business heretofore conducted by him at 708-710 Myrtle avenue, Brooklyn, N. Y., under the name of John F. Abernethy & Company, Inc. The business will be continued under the same management.

Du Pont Everdur Company has been organized to take over the manufacture and sale of the metal alloy known as Everdur No. 50, heretofore handled by the Du Pont Engineering Company. The new company, which will operate as a subsidiary of the Du Pont Company, will manufacture the metal at Wilmington, Del. H. Grubb is president; H. M. Pierce, vice-president; J. B. Eliason, treasurer; Charles Copeland, secretary; M. D. Fisher, assistant secretary. Directors: R. R. M. Carpenter, chairman; William Coyne, H. Grubb, H. M. Pierce Charles B. Jacobs.

The **Electro-Chemical Pattern & Manufacturing Company** was organized in March with a capital of $40,000 first preferred stock and 10,000 shares of no-par stock, succeeding the State Pattern & Manufacturing Company, a co-partnership. For the past three years the latter company has been making metal patterns and coreboxes of copper by electro deposition, or in other words by a process similar to the electrotyping process. Up to now their business was confined to local territory but the new corporation plans to extend its business to all parts of the country. The company is located at 740 Meldrum avenue, Detroit, Mich., where they have a completely equipped plant for turning out this class of work.

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America	$100	$620	$650
American Hardware Corporation	100	88	90
Anaconda Copper	50	37⅝	37¾
Bristol Brass	25	6	10
International Nickel, com	25	26⅛	26⅜
International Nickel, pfd	100	98	98¼
International Silver, com	100	140	145
International Silver, pfd	100	106	110
National Enameling & Stamping	100	31¼	33
National Lead Company, com	100	145½	147
National Lead Company, pfd	100	116	117½
New Jersey Zinc	100	183½	186
Rome Brass & Copper	100	140	150
Scovil Manufacturing Company	..	225	235
Yale & Towne Mfg. Company, new	..	63	65

Corrected by J. K. Rice, Jr., Co., 36 Wall street, New York.

ZINC IMPROVEMENT NEAR

The world zinc market is greatly depressed, but improvement is in sight, in the opinion of A. J. M. Sharpe of the International Metal Service, London, whose special report was read April 27, 1925, by S. S. Tuthill, of New York, secretary, before the American Zinc Institute of New York.

"Admittedly," the report continued, "the United States consumption of zinc is huge, and unsold stocks are now decidedly small, especially of prime Western, but it is equally true that the United States production, in the light of current events, is on the high side, and unless curtailment is decided upon the situation will grow worse.

"From June onward it is possible to take a brighter view, and, assuming a normal recovery in business following the present slump, the zinc position should rest on surer foundations."

EXPOSITION OF INVENTIONS

The Exposition of Inventions of the American Institute of the City of New York was held in the Engineering Societies Building, 29 West 39th street, New York. This Exposition included a program of lectures, demonstrations and exhibits on the subject of inventions of today. Among the exhibitors were numerous manufacturers of metal products, showing devices in which metals played an important part.

Review of the Wrought Metal Business

Written for The Metal Industry by J. J. WHITEHEAD, President of the Whitehead Metal Products Company of New York, Inc.

MAY 1, 1925.

The advance in the price of ingot copper in the last week of April was followed by a corresponding increase in prices for copper and brass material in the form of rods, sheets, wire and tubes. Some buyers who were holding off up to that time were induced to purchase when this advance was made, but aside from buying of this character there was comparatively little business done for future deliveries, as the rank and file of buyers were very free to express their lack of confidence in the ability of the producers to maintain prices on the new level. It is probable that this lack of confidence was inspired to some degree by the unexpected and swift character of the advance in price which happened practically over night and without warning.

The general lack of enthusiasm over the prospect of any continued advance in prices is attributed generally to the reports which have been made public indicating an over-production of ingot metal in spite of the stupendous and record-breaking consumption. This fact has been recognized by some of the largest producers and reports of a curtailment in production have been filtering through from time to time, but whether any actual substantial reduction in production is really being made is doubtful in the minds of many buyers.

Insofar as the mills fabricating brass and copper rod, sheet, tube and wire are concerned, it can be said that on the whole they are very busy, with one or two mills working overtime. Nearly all the mills admit that their order books are still in fairly healthy condition, and that they have no complaint to make with the volume of business, but the mad scramble for business continues with the price-cutting fever running free and unchecked. The question as to why a price situation of so unsatisfactory a character should exist in view of the volume of business which is being placed, can best be answered by those who are responsible for it. No one however seems to be willing to take this responsibility; all admit the futility of it, but each waits for the other to take some steps in the direction of correcting it.

April proved to be one of the largest months on record in nickel, nickel alloys and Monel metal. The continued progress in this line on a basis of absolute price stability has resulted in developing a condition which is giving complete satisfaction to the producers. There are no disturbing fluctuations in prices, the element of speculation in purchasing is entirely missing, and all who are connected with the industry are well pleased with the whole situation.

An important development of general interest to the metal industry is a method by which oxide is eliminated during the rolling and drawing processes of nickel-chromium alloys. Heretofore, nickel-chromium wire and strip products have had a heavy film of oxide. In fact, in many instances the oxide penetrated deeply into the alloy and was the cause of the majority of burnouts of industrial electrical heating elements. As a result of this development the free from oxide alloy has been termed "super-nickelchrome." It is composed of 80 per cent electrolytic nickel and 20 per cent pure carbon-free chromium. The finished product has a bright silvery finish, making it adaptable for many commercial uses requiring extremely high temperatures or acid resistance.

Metal Market Review

Written for The Metal Industry by METAL MAN

MAY 1, 1925.

COPPER

New demand for copper was comparatively light during the greater part of April. The statistical position, as revealed by the figures for the first quarter of the year, were particularly unfavorable from a seller's point of view. The heavy increase in output and a substantial increase to surplus stocks had a bad effect on prices. Market values gave way once more to 13¼ cents shortly after the middle of the month. The market responded promptly, however, on the prospect of output being curtailed by Anaconda and affiliated companies. Buying was renewed on a fair scale, and the market soon rose to 13⅝ cents. A sharp advance in the foreign price also occurred, and large London sales helped local sentiment. The political change in Germany came on the heels of the improved outlook for copper. The new developments have introduced a disappointing phase into the foreign situation which will take time to measure and appreciate fully. American producers and holders, however, continue firm.

ZINC

Domestic demand was confined to a moderate tonnage in recent weeks. Production of zinc expanded too rapidly for outlet. Foreign buying interest was again manifested lately, but unless export demand becomes more pronounced, fresh selling pressure may be expected to develop. Output in March was the largest for any month this year and reached 51,485 tons, against 46,811 tons in February. Galvanizers are not active enough to make a definite impression on sales. Stocks on April 1 were only 17,196 tons, a very moderate surplus compared with a carryover of 32,074 tons on April 1, 1924. Present price of 7.40c. New York, compares with 6.25c. on April 30, 1924.

TIN

Erratic movements have characterized the tin market lately. Speculative manipulations are a constant and often a controlling factor in price tendencies. Statistics have been favorable to sound market conditions. There was a decrease in the world's visible of 3,968 tons during March. Consumers, however, are not quite ready to be carried away simply on the statistical showing. Other considerations are taken into account, particularly that of the present high price level; also probable business developments over the next six months. Tin at anything over 50 cents a pound is open for sudden changes.

New York prices of Straits tin, April 27, were quoting 54.25 and 54.65c. for spot, and 53.90c. and 54.40c. for May delivery. These figures compared with 52⅝c. on April 1. Average price of Straits tin in New York in 1924 was 50.20c.; in 1923, 42.71c., and in 1922, 32.58c. The average for 1921 was 30 cents a pound.

LEAD

Supplies were on an ample scale at the concessions named by sellers, and consumers had no trouble in covering their requirements on the easier terms established from time to time. There were four price changes between April 1 and 21, and these were all on a downward scale. Between the dates mentioned, the price declined from 8¼c. to 7¾c. New York basis.

Consumption continues large, but producers have been pushing output vigorously for a long time. The incentive of high values has stimulated the production of ore and pig lead at all sources. Cost of production has been lowered, and present price yields substantial profits to most producers.

ANTIMONY

Antimony has been arriving in round quantities lately and more is on the way. Market prices have declined to 10⅞ cents for May delivery duty paid, and shipments from China could probably be bought for a shade below these figures. Large arrivals of Chinese regulars has weakened prices, and consumers have no need to worry over the question of adequate supplies. Prices, however, have reached a level calculated to attract more attention.

ALUMINUM

The outstanding feature in Aluminum is the stability of the price situation. Consumption is evidently at a record rate. Demand is taking output rapidly so that producers and importers have no need to stock up metal for which no outlet exists. Price of 98-99% virgin aluminum is maintained at 27c. a pound, and this level has prevailed for several months. Activity in the automobile industry has furnished a substantial setting for the remarkable strength of this market.

QUICKSILVER

Demand was dull, recently, but despite this condition the price holds up fairly steady at about $83 a flask. Imports are running smaller than last year.

PLATINUM

The tone of this market keeps steady on basis of $117 and $118 for refined metal. Buying is on a moderate basis, but without indications of any important increase to supplies the market is maintained at a satisfactory level.

SILVER

Movements in silver have not produced pronounced price changes lately. The market for bullion recently has moved within a narrow range. Present price quotes 66¾c. per ounce at New York. India has been a buyer and China a seller lately. Stocks of silver at Shanghai are unusually large, and act as a damper on higher prices. Expectations that Germany and Russia would place important orders have not been realized as yet, but relatively large orders are expected ultimately from abroad.

OLD METALS

Lead and copper have been specially depressed for a considerable period, but improvement is looked forward to now that copper is firmer and lead steady. Aluminum grades have been a notable exception to prevalent weakness in other metals. There was more inquiry for copper and brass material recently from both domestic and foreign buyers. Prices dealers are willing to pay are: Heavy copper, 11¼@11½; light copper, 9¼@9½; heavy brass, 6¾@7; heavy lead, 6½@6¾; old zinc, 4¼@4½, and aluminum clippings, 21½@22.

WATERBURY AVERAGE

Lake Copper—Average for 1924, 13.419—January, 1925, 15.125—February, 15.00—March, 14.375—April, 13.625.

Brass Mill Zinc—Average for 1924, 7.10—January, 1925, 8.60—February, 8.00—March, 8.10—April, 7.60.

In reviewing the year 1924 in the business of the National

Daily Metal Prices for the Month of April, 1925

Record of Daily, Highest, Lowest and Average

	1	2	3	6	7	8	9	*10	13	14	15	16	17
Copper (f. o. b. Ref.) c/lb. Duty Free													
Lake (Delivered)	13.75	13.75	13.75	13.50	13.75	13.75	13.75	.....	13.75	13.75	13.625	13.50	13.375
Electrolytic	13.65	13.50	13.50	13.45	13.45	13.60	13.60	.....	13.60	13.55	13.45	13.30	13.15
Casting	13.375	13.25	13.25	13.25	13.25	13.30	13.30	.....	13.30	13.25	13.125	13.125	13.00
Zinc (f. o. b. St. L.) c/lb. Duty 1¾c/lb													
Prime Western	7.125	7.05	7.10	7.10	7.10	7.15	7.15	.....	7.10	7.075	7.00	6.95	6.85
Brass Special	7.225	7.15	7.20	7.20	7.20	7.25	7.25	.....	7.20	7.20	7.15	7.15	7.05
Tin (f. o. b. N. Y.) c/lb. Duty Free													
Straits	52.625	51.75	51.50	50.50	51.125	51.125	50.25	.....	50.50	50.00	50.50	50.625	51.50
Pig 99%	51.875	51.00	50.75	49.875	50.50	50.50	49.625	.....	49.75	49.375	49.875	50.00	50.75
Lead (f. o. b. St. L.) c/lb. Duty 2⅛c/lb	8.05	8.00	8.00	7.95	7.85	7.85	7.80	.....	7.75	7.725	7.65	7.60	7.50
Aluminum c/lb. Duty 5c/lb.	28.00	28.00	28.00	28.00	28.00	28.00	28.00	.....	28.00	28.00	28.00	28.00	28.00
Nickel c/lb. Duty 3c/lb.													
Ingot	31.00	31.00	31.00	31.00	31.00	31.00	31.00	.....	31.00	31.00	31.00	31.00	31.00
Shot	32.00	32.00	32.00	32.00	32.00	32.00	32.00	.....	32.00	32.00	32.00	32.00	32.00
Electrolytic	38.00	38.00	38.00	38.00	38.00	38.00	38.00	.....	38.00	38.00	38.00	38.00	38.00
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	14.00	14.00	14.00	13.90	13.90	14.00	13.875	.....	13.50	13.50	12.00	11.875	12.00
Silver c/oz. Troy Duty Free	66.875	66.75	66.75	67.125	66.875	66.875	66.875	.....	67.25	67.375	67.125	66.875	66.875
Platinum $/oz. Troy Duty Free	118	118	118	118	118	118	118	.....	118	118	118	118	118

	20	21	22	23	24	27	28	29	30	High	Low	Aver.
Copper (f. o. b. Ref.) c/lb. Duty Free												
Lake (Delivered)	13.375	13.50	13.50	13.50	13.75	13.75	13.75	13.75	13.75	13.75	13.375	13.649
Electrolytic	13.20	13.35	13.35	13.40	13.65	13.65	13.65	13.65	13.60	13.65	13.15	13.490
Casting	13.00	13.00	13.00	13.00	13.35	13.25	13.25	13.25	13.25	13.375	13.00	13.196
Zinc (f. o. b. St. L.) c/lb. Duty 1¾c/lb												
Prime Western	6.85	6.85	6.85	6.95	7.05	7.00	6.95	6.95	6.875	7.15	6.85	7.004
Brass Special	6.95	6.975	7.00	7.00	7.20	7.15	7.10	7.10	7.00	7.25	6.95	7.129
Tin (f. o. b. N. Y.) c/lb. Duty Free												
Straits	51.25	52.375	52.75	53.625	54.00	54.50	55.25	56.00	54.75	56.00	50.00	52.214
Pig 99%	50.50	51.75	52.00	52.875	53.25	53.75	54.50	55.125	54.00	55.125	49.375	51.506
Lead (f. o. b. St. L.) c/lb. Duty 2⅛c/lb	7.40	7.35	7.30	7.40	7.50	7.45	7.60	7.60	7.55	8.05	7.30	7.661
Aluminum c/lb. Duty 5c/lb.	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00
Nickel c/lb. Duty 3c/lb.												
Ingot	31.00	31.00	31.00	31.00	31.00	31.00	31.00	31.00	31.00	31.00	31.00	31.00
Shot	32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00
Electrolytic	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	11.875	11.875	11.25	11.00	11.00	11.00	11.125	11.50	11.75	14.00	11.00	12.520
Silver c/oz. Troy Duty Free	66.875	67.00	66.75	66.50	66.50	66.75	67.00	67.00	67.125	67.375	66.50	66.911
Platinum $/oz. Troy Duty Free	118	118	118	118	118	118	118	118	118	118	118	118

*Holiday.

Metal Prices, May 4, 1925

Copper: Lake, 13.75. Electrolytic, 13.50. Casting, 13.125.
Zinc: Prime Western, 6.90. Brass Special, 7.00.
Tin: Straits, 54.00. Pig, 99%, 53.25.
Lead: 7.95. **Aluminum,** 28.00. **Antimony,** 12.50.

Nickel: Ingot, 31.00 Shot, 32.00. Electrolytic, International Nickel Company, 38.00.
Quicksilver, flask, 75 lbs., 81.00. Silver, oz. Troy, 67.50.
Platinum, oz. Troy, 118.00. **Gold,** oz. Troy, 20.67.

Metal Prices, May 4, 1925

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	10½to12
Brass Ingots, Red	11¼to13
Bronze Ingots	12 to13
Bismuth	$1.95
Cadmium	50 to60
Casting Aluminum Alloys	21 to24
Cobalt—97% pure	$2.50to$2.60
Manganese Bronze Castings	22 to40
Manganese Bronze Ingots	12 to16
Manganese Bronze Forging	34 to42
Manganese Copper, 30%	28 to45
Parsons Manganese Bronze Ingots	18¼to19¾
Phosphor Bronze	24 to30
Phosphor Copper, guaranteed 15%	18½to21
Phosphor Copper, guaranteed 10%	18 to20
Phosphor Tin, guaranteed 5%	65 to70
Phosphor Tin, no guarantee	59 to70
Silicon Copper, 10% ......according to quantity	28 to35

OLD METALS

Buying Prices		Selling Prices
12¼to12½	Heavy Cut Copper	13¼to13¾
12 to12¼	Copper Wire	13 to13½
10¼to10½	Light Copper	11½to12
9¼to 9½	Heavy Machine Comp	10¾to11¼
7¾to 8	Heavy Brass	8¾to 9¼
6¾to 7	Light Brass	8 to 8¼
8¼to 8¾	No. 1 Yellow Brass Turnings	9¾to10
8½to 9	No. 1 Comp. Turnings	10 to10½
8 to 8¼	Heavy Lead	8¾to 9
4¾to 5	Zinc Scrap	5¾to 6
10	Scrap Aluminum Turnings	12 to14
16 to17	Scrap Aluminum, cast alloyed	18 to19
20	Scrap Aluminum, sheet (new)	23 to25
32	No. 1 Pewter	36 to38
12	Old Nickel anodes	14
18	Old Nickel	20

BRASS MATERIAL—MILL SHIPMENTS

In effect April 24, 1925

To customers who buy 5,000 lbs. or more in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	$0.18⅛	$0.19⅞	$0.21⅞
Wire	.18⅝	.20⅜	.22⅜
Rod	.15⅞	.20⅝	.22⅝
Brazed tubing	.26⅛	......	.31⅝
Open seam tubing	.26⅛	......	.31⅝
Angles and channels	.29⅛	......	.34⅝

To customers who buy less than 5,000 lbs. in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	$0.19⅛	$0.20⅞	$0.22⅞
Wire	.19⅝	.21⅜	.23⅜
Rod	.16⅞	.21⅝	.23⅝
Brazed tubing	.27⅛	......	.32⅝
Open seam tubing	.27⅛	......	.32⅝
Angles and channels	.30⅛	......	.35⅝

SEAMLESS TUBING

Brass, 22¾c. to 23¾c.
Copper, 23¾c. to 24¾c.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	20⅛c. net base
Muntz or Yellow Metal Sheathing (14"x48")	18⅛c. net base
Muntz or Yellow Rectangular sheet other Sheathing	19⅛c. net base
Muntz or Yellow Metal Rod	16⅛c. net base

Above are for 100 lbs. or more in one order.

COPPER SHEET

Mill shipments (hot rolled)	20¾c. to 23¼c. net base
From stock	21¾c. to 23¾c. net base

BARE COPPER WIRE—CARLOAD LOTS

16c. to 16¼c. net base.

SOLDERING COPPERS

300 lbs. and over in one order	20¼c. net base
100 lbs. to 200 lbs. in one order	20¾c. net base

ZINC SHEET

Duty, sheet, 15%	Cents per lb.
Carload lots, standard sizes and gauges, at mill, less 8 per cent discount	10.00 basis
Casks, jobbers' price	11.25 net base
Open Casks, jobbers' price	11.75 to 12.00 net base

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base price	40c.
Aluminum coils, 24 ga., base price	36.70c.
Foreign	40c.

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Nickel Silver Sheet Metal

10% Quality	25¾c.
15% "	27¼c.
18% "	28¼c.

Nickel Silver Wire and Rod

10% "	28¾c.
15% "	32¼c.
18% "	35½c.

MONEL METAL

Shot	32
Blocks	32
Hot Rolled Rods (base)	40
Cold Drawn Rods (base)	48
Hot Rolled Sheets (base)	42

BLOCK TIN SHEET AND BRITANNIA METAL

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c. over Pig Tin. 50 to 100 lbs., 15c. over 25 to 50 lbs., 17c. over, less than 25 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c. over Pig Tin. 50 to 100 lbs., 15c. over, 25 to 50 lbs., 20c. over, less than 25 lbs. 25c. over. Above prices f. o. b. mill.

SILVER SHEET

Rolled silver anodes .999 fine are quoted at from 69¾c. to 71¾c. per Troy ounce, depending upon quantity.

Rolled sterling silver 67c. to 69c.

NICKEL ANODES

90 to 92% purity	43 c.-45 c. per lb
95 to 97% purity	45 c.-47 c. per lb

Supply Prices, May 4, 1925

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.10–.14
Acid—		
Boric (Boracic) Crystals	lb.	.12
Hydrochloric (Muriatic) Tech., 20°, Carboys	lb.	02
Hydrochloric, C. P., 20 deg., Carboys	lb.	.06
Hydrofluoric, 30%, bbls	lb.	.08
Nitric, 36 deg., Carboys	lb.	.06
Nitric, 42 deg., Carboys	lb.	.07
Sulphuric, 66 deg., Carboys	lb.	.02
Alcohol—		
Butyl	lb.	.26½–.30
Denatured in bbls	gal.	.60–.62
Alum—		
Lump Barrels	lb.	.04
Powdered, Barrels	lb.	.04½
Aluminum sulphate, commercial tech	lb.	.02⅛
Aluminum chloride solution in carboys	lb.	.06½
Ammonium—		
Sulphate, tech., bbls	lb.	.03¼
Sulphocyanide	lb.	.65
Argols, white, see Cream of Tartar	lb.	.27
Arsenic, white, kegs	lb.	.16
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Blue Vitriol, see Copper Sulphate.		
Borax Crystals (Sodium Biborate), bbls	lb.	.05½
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.06
Chrome Green, bbls	lb.	.34
Cobalt Chloride	lb.	—
Copper—		
Acetate	lb.	.37
Carbonate, bbls	lb.	.17
Cyanide	lb.	.50
Sulphate, bbls	lb.	.05¼
Copperas (Iron Sulphate, bbl.)	lb.	.01½
Corrosive Sublimate, see Mercury Bichloride.		
Cream of Tartar Crystals (Potassium bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05–.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$75.00
Fusel Oil	gal.	$4.50
Gold Chloride	oz.	$14.00
Gum—		
Sandarac	lb.	.26
Shellac	lb.	.59–.61
Iron, Sulphate, see Copperas, bbl	lb.	.01½
Lead Acetate (Sugar of Lead)	lb.	.13
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.15
Nickel—		
Carbonate dry, bbls	lb.	.29
Chloride, 100 lb. lots	lb.	.21
Salts, single bbls	lb.	.10½
Salts, double bbl.	lb.	.10
Paraffin	lb.	.05–.06
Phosphorus—Duty free, according to quantity		.35–.40
Potash, Caustic Electrolytic 88-92% fused, drums	lb.	.08¾
Potassium Bichromate, casks	lb.	.08¾
Carbonate, 80-85%, casks	lb.	.05¾
Cyanide, 165 lb. cases, 94-96%	lb.	.57½
Pumice, ground, bbls	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls	lb.	.03
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.08
Silver Chloride, dry	oz.	.86
Cyanide (Fluctuating Price)	oz.	.65
Nitrate, 100 ounces lots	oz.	.48
Soda Ash, 58%, bbls	lb.	.02½
Sodium—		
Biborate, see Borax (Powdered), bbls	lb.	.05½
Cyanide, 96 to 98%, 100 lbs	lb.	.22
Hyposulphite, kegs	lb.	.04
Nitrate, tech., bbls	lb.	.04¼
Phosphate, tech., bbls	lb.	.03¼
Silicate (Water Glass), bbls	lb.	.02
Sulpho Cyanide	lb.	.45
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	.13
Sulphur (Brimstone), bbls	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.38½
Tripoli, Powdered	lb.	.03
Verdigris, see Copper Acetate	lb.	.37
Water Glass, see Sodium Silicate, bbls	lb.	.02
Wax—		
Bees, white ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½–.06
Zinc, Carbonate, bbls	lb.	.11
Chloride, 600 lb. lots	lb.	.08
Cyanide	lb.	.41
Sulphate, bbls	lb.	.03¼

COTTON BUFFS

Open buffs, per 100 sections (nominal),

12 inch, 20 ply, 64/68, unbleached sheeting	base,	$32.40–$40.85
14 inch, 20 ply, 80/96, " "	base,	45.25– 50.80
12 inch, 20 ply, 80/96, " "	base,	47.35– 46.20
14 inch, 20 ply, 84/92, " "	base,	63.15– 62.25
12 inch, 20 ply, 88/96, " "	base,	..... 63.25
14 inch, 20 ply, 88/96, " "	base,	..... 85.15
12 inch, 20 ply, 80/96, " "	base,	..... 52.70
14 inch, 20 ply, 80/96, " "	base,	..... 70.80
Sewed Buffs, per lb., bleached and unbleached	base,	.55 to .75

FELT WHEELS

U. S. A. Brand		Price Per Lb. Less Than 100 Lbs.	300 Lbs. and Over
Diameter—10" to 16"	1" to 3"	$3.00	$2.65
" 6" 8" and over 16"	1" to 3"	3.10	2.75
" 6" to 24"	Over 3"	3.40	3.05
" 6" to 24"	½" to 1"	4.00	3.65
" 4" to 6"	¼" to 3"	4.85	Any quantity
" Under 4"	¼" to 3"	5.45	Any quantity

Grey Mexican or French Grey—10c. less per lb. than Spanish, above.

FELT WHEELS

	6" to 18"	Over 18"	Under 6"
Over 3"	$3.00	$3.30	$3.75
1" to 3"	2.60	2.70	3.75
Under 1"	3.30	3.60	3.75